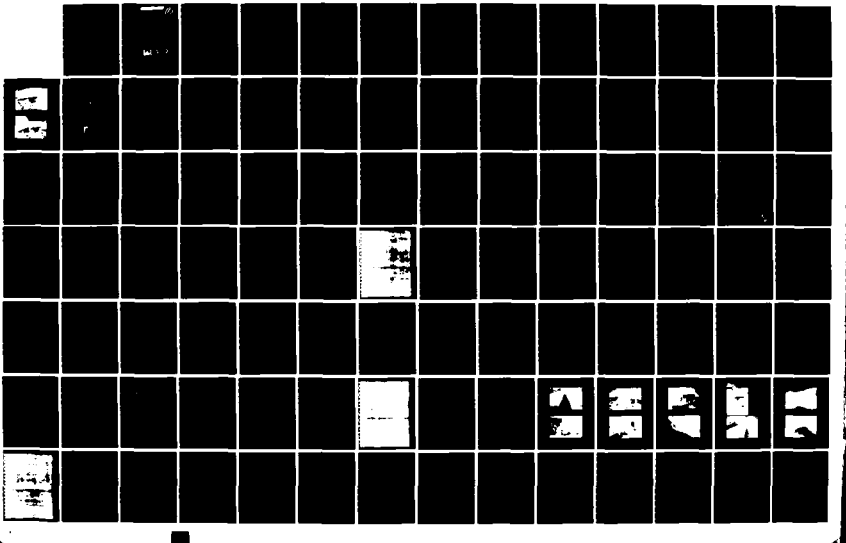
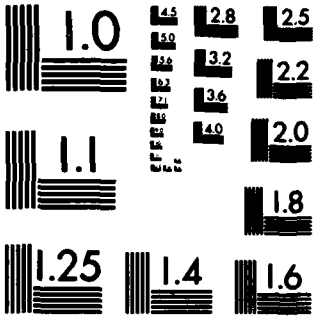
AD-A145 390 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 1/2
GLENDALE DAM (MA 0002.. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JUL 79

UNCLASSIFIED F/G 13/13 NL



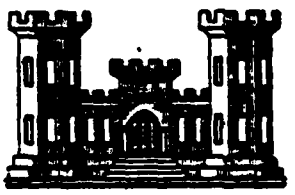


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

HOUSATONIC RIVER BASIN
STOCKBRIDGE, MASSACHUSETTS

GLENDALE DAM
MA 00021

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JULY 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 00021	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Glendale Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE July 1979 13. NUMBER OF PAGES 75
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Housatonic River Basin
Stockbridge, Massachusetts

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Glendale Dam is a concrete, gravity-type structure 240 ft. in length and a maximum of 32 ft. in height. The concrete dam is in fair condition. Based on the "intermediate" size and "significant" hazard potential classifications. The test flood for this dam is ½ the PMF. Glendale Dam is condirmed as having "significant" hazard potential in accordance with Corps of Engineers guidelines.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

NOV 13 1979

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Glendale Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Housatonic Energy Conservation Association, Stockbridge, Massachusetts 01262.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

HOUSATONIC RIVER BASIN
STOCKBRIDGE, MASSACHUSETTS

GLENDALE DAM
MA 00021

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JULY 1979

PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM

Identification No.:	MA 00021
Name of Dam:	Glendale
Town:	Stockbridge
County:	Berkshire
State:	Massachusetts
Stream:	Housatonic River
Date of Site Visit:	30 May 1979

BRIEF ASSESSMENT

Glendale Dam is a concrete, gravity-type structure 240 ft. in length and a maximum of 32 ft. in height. The dam has two low-level waste outlets and two outlets at the entrance to a channel leading to an abandoned downstream power generating station. The dam, channel and power station were completed in 1906 to generate power for a paper mill. The project is currently being renovated for the purpose of again generating hydro-electric power.

Due to the appreciable extent of downstream development that would be affected in the event the dam were to fail, Glendale Dam is confirmed as having "significant" hazard potential in accordance with Corps of Engineers guidelines.

The concrete dam is in fair condition, because of joint and surface deterioration observed during the visual examination of the structure. There was no evidence of settlement, lateral movement or other signs of structural failure, or other conditions which would warrant urgent remedial action. It is recommended that repairs be made to the upstream face of the dam prior to filling the reservoir and that the dam be kept under observation by an engineer during the closing of the waste outlets and filling of the reservoir.

Based on the "intermediate" size and "significant" hazard potential classifications in accordance with Corps of Engineers guidelines, the test flood for this dam is one-half the Probable Maximum Flood (1/2 PMF). Hydraulic analyses indicate that the test flood outflow of 78,400 cfs (inflow 93,800 cfs or 336.8 csm) would overtop the left abutment wall, considered to be the top of dam, by about 16 ft. With the water level at the top of dam, the spillway

capacity is approximately 9,360 cfs, which is 12 percent of the test flood outflow. This would be the case because of the extremely high test flood outflow and the restrictions of the channel cross-section at the dam.

Housatonic Energy Conservation Association, owner of the dam, should engage a registered professional engineer to perform a detailed investigation of the structural condition of the dam, recommend necessary repairs to the structure and perform a detailed hydraulic/hydrologic investigation to determine the need and means of increasing the spillway capacity as outlined in Section 7.2. Any necessary modifications or repairs resulting from the investigations, and remedial measures including removal of accumulated debris at the outlets, renovation of the gatehouse facility, preparation of a formal operations and maintenance manual for the dam and establishment of an emergency preparedness plan, as outlined in Section 7.3, should be implemented by the Owner within one year after receipt of this report.

HALEY & ALDRICH, INC.

Harl Aldrich
President

This Phase I Inspection Report on Glendale Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

JOSEPH W. FENEGAN, JR., MEMBER
Water Control Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH A. MCELROY, CHAIRMAN
Chief, NED Materials Testing Lab.
Foundations & Materials Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the office of Chief of Engineers, Washington, DC 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm run-off), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential. Consideration of downstream flooding other than in the event of a dam failure is beyond the scope of this investigation.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

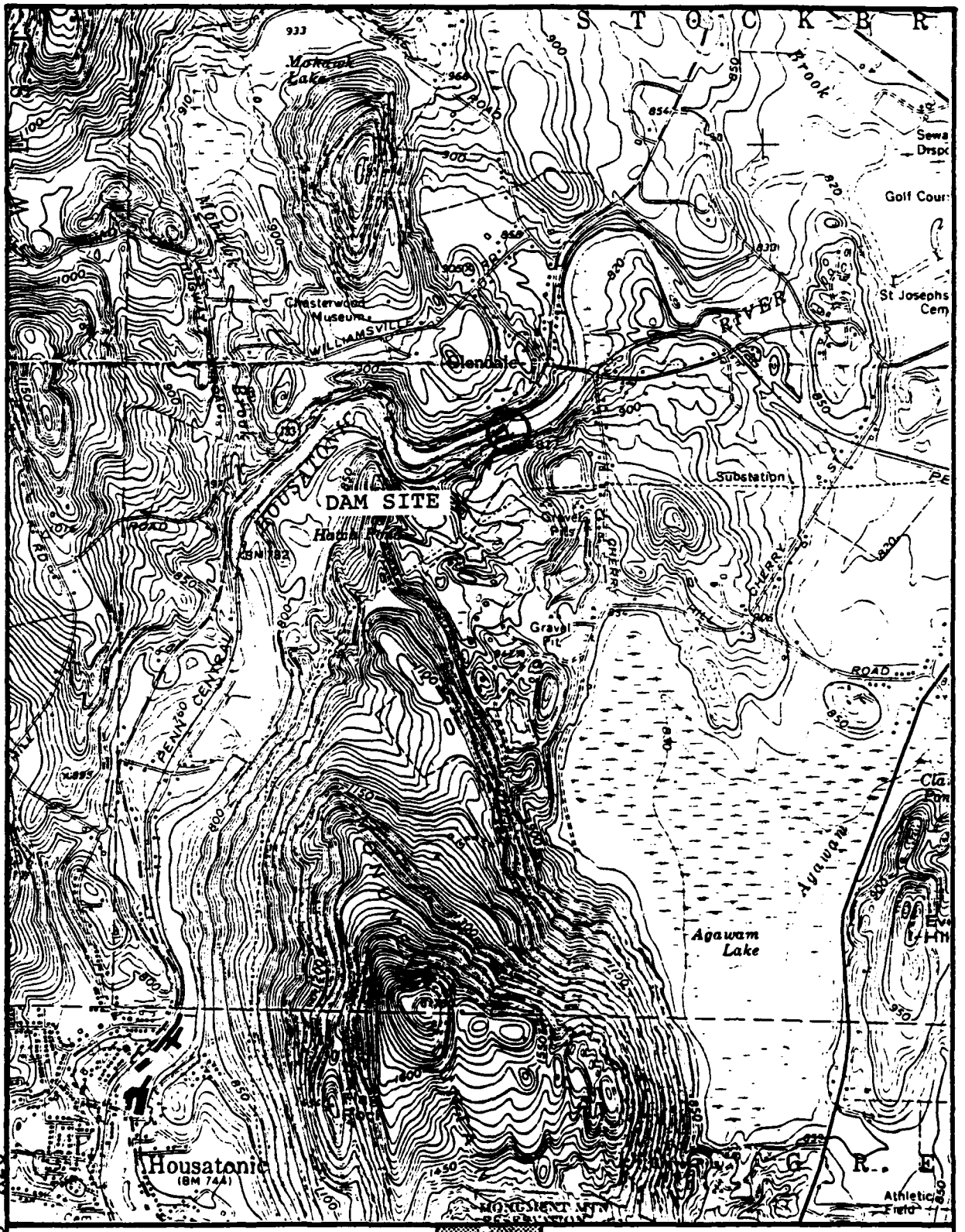
TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

1. Overview of Glendale Dam spillway structure

2. Gatehouse above waste-way and power channel outlets



FILE NO. 4270 A26

DAM: GLENDALE

IDENTIFICATION NO. MA 00021

N

LOCATION MAP
USGS QUADRANGLE

STOCKBRIDGE, MA

APPROX. SCALE: 1"= 2000'

PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM
GLENDALE DAM
MA 00021

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region.

Haley & Aldrich, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed were issued to Haley & Aldrich, Inc. under a letter dated 28 November 1978 from Colonel Max B. Scheider, Corps of Engineers. Contract No. DACW33-79-C-0018 has been assigned by the Corps of Engineers for this work. Camp, Dresser & McKee, Inc. was retained as consultant to Haley & Aldrich, Inc. on the structural, mechanical/electrical and hydraulic/hydrologic aspects of the Investigation.

b. Purpose of Inspection. The primary purposes of the National Dam Inspection Program are to:

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

2. Encourage and prepare the states to initiate effective dam safety programs for non-Federal dams.

3. Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Glendale Dam spans the Housatonic River near Glendale, Massachusetts, as shown on the Location Map, page vii. The latitude and longitude of the dam site are N42°16.8' and W73°20.7'. The Housatonic River flows in a generally southward direction from the dam for about 80 miles through Massachusetts and Connecticut before it discharges into Long Island Sound.

b. Description of Dam and Appurtenances. The dam consists of a 26 ft. high gravity-type concrete spillway structure, Photo No. 1. Adjacent to the spillway on the right is a wooden gatehouse, Photo No. 2, built on a concrete substucture with two low-level waste outlets and two outlets to a channel which leads to a downstream power station. The overall length of the dam is about 240 ft. and its maximum height is approximately 32 ft. The general configuration of the project is shown on the "Site Plan Sketch", page C-1.

Based on the only available detailed drawing of the dam (included as page B-23), the crest of the 182 ft. long concrete ogee spillway is El. 810.9 National Geodetic Vertical Datum (NGVD) or 6.0 ft. below the adjacent abutment wall, considered to be the top of dam. The spillway is shown on this drawing to have a seepage wall to ledge (bedrock) and a toe wall. Bedrock is exposed at the base of the concrete left training wall (abutment). The spillway structure is shown on Photos No. 1, 3 and 4.

The large wooden gatehouse contains gate operating mechanisms for the four outlets through the concrete substructure. Two 8 ft. square waste outlets at invert El. 783.4 discharge to the river between two concrete walls to the right of the spillway, Photo No. 7. Two 10 ft. square outlets at invert El. 796.4, Photo No. 9, are at the entrance to a power channel excavated into the right bank of the river. Downstream elevation, plan and section views of the outlet works and the configuration of the approximately 2,000 ft. long channel from the dam to the power station are shown on page B-23.

c. Size Classification. The storage to the top of Glendale Dam is estimated to be 2,550 acre-ft., and

the height of the dam is approximately 32 ft. Because the maximum storage capacity is between 1,000 and 50,000 acre-ft., the dam is classified in the "intermediate" size category according to guidelines established by the Corps of Engineers.

d. Hazard Classification. The preliminary computations for dam failure analysis presented in Appendix D and based on the Corps of Engineers' "Guidance for Estimating Downstream Dam Failure Hydrograph" confirm that this dam has a "significant" hazard potential. A failure of the concrete dam has the potential to cause loss of a few lives and appreciable damage to residential and commercial developments along the Housatonic River. However, the impact of a dam failure in terms of loss of human lives is expected to be reduced if extensive downstream flooding precedes the failure.

e. Ownership. Glendale Dam was purchased in August 1977 from the Town of Stockbridge by the current owner, whose name, address and phone number are:

Housatonic Energy Conservation
Association
Sergeant Street
Stockbridge, MA 01262
Phone: (413) 298-3141

Housatonic Energy Conservation Association is a partnership consisting of Mrs. Mary C. Heather and her brother, Mr. Joseph A. Guerrieri. Mrs. Heather represented the owner throughout the course of this investigation.

The Town of Stockbridge took the power generating facility, including the dam, in lieu of delinquent taxes in 1960. The dam was originally owned by Monument Mills, which closed in 1947.

f. Operator. The current owners have not yet named anyone as operator of the dam. Until another individual is designated this responsibility, Mrs. Mary C. Heather would be responsible for the operation, maintenance and safety of the dam. Mrs. Heather's address is Sergeant Street, Stockbridge, MA 01262, and her phone number is (413) 298-3141.

g. Purpose of Dam. The dam was originally built in 1906 to generate hydroelectric power for Monument Mills at the downstream power station. The paper mill went out of business in 1947 and the power station was abandoned around 1955, according to Mrs. Heather. The outlet works at the dam and the downstream power station have been undergoing renovation since 1977 in an attempt to again generate hydroelectric power at the facility.

h. Design and Construction History. The dam, canal and power station were completed in 1906. In 1946, the spillway and abutment walls were treated with gunite, according to a prior county inspection report. The current owner intends to install outlet gates and put the facility back in operation by Fall, 1979.

i. Normal Operational Procedures. There were no formal or informal operational procedures disclosed for Glendale Dam. The present condition of the dam would indicate that the facility has not been operational for some time. A county inspection report dated 26 August 1968 indicates that the facility was inoperable at that time, and stated that the former purpose of the dam was to supply power for a generating station downstream. The present owner indicated that they plan to operate the power station by diverting water through the existing power channel.

1.3 Pertinent Data

a. Drainage Area. Glendale Dam is located on the Housatonic River. The watershed draining to Glendale Dam is composed of approximately 45 percent mountains, approximately 49 percent rolling hills, and approximately 6 percent flat land, lakes and ponds. The total drainage area encompasses approximately 278.5 square miles, as shown on page D-1.

b. Discharge at Dam Site

1. Outlet works.....	Two waste gates (8 ft. by 8 ft. each) bypassing spillway. Two head gates (10 ft. by 10 ft. each) at entrance to power channel
2. Maximum known flood at dam site.....	Upstream water surface

	reported by Owner to be at El. 817 in January 1949 (possibly higher September 1938)
3. Ungated spillway capacity at top of dam.....	9,360 cfs at El. 816.9
4. Ungated spillway capacity at test flood pool elevation.....	65,700 cfs at El. 832.9
5. Gated spillway capacity at normal pool elevation.	Not applicable
6. Gated spillway capacity at flood pool elevation..	Not applicable
7. Total spillway capacity at test flood pool elevation.....	65,700 cfs at El. 832.9
8. Total project discharge at test flood pool elevation.....	78,400 cfs at El. 832.9

c. Elevation (ft. above NGVD)

1. Streambed at centerline of dam.....	784 (Approx.)
2. Maximum tailwater.....	Unknown
3. Upstream portal invert diversion tunnel.....	Not applicable
4. Normal pool.....	801.8 (Waste outlets open)
5. Full flood control pool..	Not applicable
6. Spillway crest.....	810.9
7. Design surcharge-original design.....	Unknown
8. Top of dam.....	816.9
9. Test flood design surcharge.....	832.9

d. Reservoir

1. Length of maximum pool...	7.5 mi. (Est.)
2. Length of normal pool....	0.5 mi. (Est.)
3. Length of flood control pool.....	Not applicable

e. Storage (acre-feet)

1. Normal pool	40
2. Flood control pool	Not applicable
3. Spillway crest	450
4. Top of dam	2,550
5. Test flood pool	23,000

f. Reservoir Surface (acres)

1. Normal pool	5
2. Flood control pool	Not applicable
3. Spillway crest	70
4. Top of dam	415
5. Test flood pool	2,060

g. Dam

1. Type	Concrete, gravity-type
2. Length	240 ft. overall
3. Height	32 ft. maximum
4. Top width	8 ft.
5. Side slopes	Vertical U/S, ogee-shaped D/S
6. Zoning	Not applicable
7. Impervious core	Not applicable
8. Cutoff	6 ft. thick concrete seepage wall to bedrock (reportedly)
9. Grout curtain	None disclosed

h. Diversion and Regulating Tunnel. Not applicable

i. Spillway

1. Type	Gravity-type concrete ogee
2. Length of weir	182 ft.
3. Crest elevation	810.9 NGVD
4. Gates	None
5. U/S channel	Not investigated
6. D/S channel	Steeply sloping, high banks overgrown with trees and bushes. Flows in gently meandering path to the Village of Housatonic

j. Regulating Outlets. There are provisions for four double-stemmed, manually-operated rack and pinion geared gates in the gatehouse located to the right of the ogee spillway. On the left side of the outlet structure are openings for two 8.0 ft. square waste gates with an invert of El. 783.4. These gates were not in place during the site visit. On the right side of the outlet structure are two 10 ft. square head gate openings for supplying a power channel. The furthest head gate to the right was in place during the inspection while the one to the left was missing. The invert of these gates is at El. 796.4. It was noted during the site visit that the operating mechanisms were under repair.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

No design data for the original dam were located.

2.2 Construction Data

A drawing of the dam, including a plan, sections and a downstream elevation was prepared by Robert G. Brown & Associates, Inc. in October 1977. This drawing is reportedly based on a drawing from 1905. No additional construction data were disclosed for this dam.

2.3 Operation Data

No operational records specific to this dam are available. However, there are county and state inspection reports available for the period from 1968 through 1978.

2.4 Evaluation of Data

a. Availability. A list of engineering data available for use in preparing this report is included on page B-1. Copies of documents from the listing are also included in Appendix B.

b. Adequacy. There was a lack of engineering data available to aid in the evaluation of Glendale Dam. This Phase I assessment was therefore based primarily on the visual examination, approximate hydraulic and hydrologic computations, consideration of past performance and application of engineering judgement.

c. Validity. The information contained in the engineering data may generally be considered valid. However, the 1977 drawing is reportedly based on a 1905 drawing which was probably made before the dam was completed. If so, certain details may be shown as designed and may vary slightly from those actually built. For example, the seepage wall may not extend to bedrock along the entire length of the spillway as proposed.

SECTION 3 - VISUAL EXAMINATION

3.1 Findings

a. General. The Phase I visual examination of Glendale Dam was conducted on 30 May 1979. The upstream water surface elevation was about El. 801.8 (9.1 ft. below the spillway crest) that day. River flow was through the two low-level outlets.

In general, the project was found to be in fair condition. General deterioration of concrete joints and concrete surfaces which requires further investigation was noted.

A visual inspection check list is included in Appendix A and selected photographs of the project are given in Appendix C. A "Site Plan Sketch", page C-1 shows the direction of view for each photograph.

b. Dam. The main dam is a concrete ogee spillway structure. The downstream face of the spillway has extensive spalling and surficial erosion throughout the full length of the dam, Photo No. 1. Extensive surface cracks were observed. The second joint from the right abutment has extensive erosion at the tailwater level, Photos No. 1 and 3. The first joint to the left (about 19.5 ft.) from the left abutment is leaking from a level about 16 ft. below the spillway crest, Photo No. 4. There is an eroded horizontal cold joint on the upstream face of the spillway about 4.5 ft. down from the weir crest, Photo No. 5, which runs for the major length of the spillway. Observations made during the preliminary reconnaissance of the dam indicate several other eroded horizontal cold joints exist below this elevation.

The right training wall (abutment) has extensive spalling and surficial erosion of concrete, Photo No. 7. There is extensive cracking and efflorescence of the gunited left training wall (abutment), Photos No. 3 and 4. There was a small amount of seepage observed at the base of the left abutment wall at the bedrock interface. The volume of seepage water is not more than 1 to 2 gallons per minute.

c. Appurtenant Structures. There is a deteriorated horizontal crack or cold joint at the 1/3 point below the top of the concrete intake training wall with minor seepage and efflorescence, Photo No. 5. A large amount of floating

trash has accumulated upstream of the outlet gates in the intake channel.

The gatehouse is a timber building seated on the dam, Photos No. 2, 5 and 7. The framing and sheathing are in good condition. The exterior finish is stained wood shingles which are in need of restaining. The roof was not observed, but no signs of leaking were in evidence. The window panes have been replaced by movable wooden enclosures. Three of the four wooden outlet gates are missing and the fourth, which is in poor condition, was in place and closed. The double-stemmed, manually-operated rack and pinion gate mechanisms, Photo No. 6, were not operable and appeared to be under repair. The wooden guides for the closed right power channel head gate are rotten and in poor condition, Photo No. 5.

The general condition of the concrete outlet structure is poor. There is extensive surifical deterioration on the downstream side above the waste gate openings, Photos No. 2 and 7. Extensive spalling, erosion of concrete, and a heavy amount of efflorescence were observed throughout this area. A deteriorated horizontal crack or cold joint was observed above the waste gate openings, the joints are in deteriorated condition, and there is a heavy brush growth on the concrete walls, Photo No. 7. The waste outlet training wall is also cracked, spalling and shows signs of efflorescence, Photos No. 7 and 8.

The right concrete power channel training wall is in good condition with minor deficiencies noted, Photo No. 9. The left training wall is in a deteriorated condition, Photo No. 10. There is spalling and erosion of concrete. The joints have deteriorated and spalled and contain some brush growth. The surfaces of the wall have cracking and efflorescence present.

The power channel is a heavy stone-lined trapezoidal channel which, in general, is in good condition. However, in one area on the right side downstream of the concrete training wall, the side slope was collapsed into the channel, Photo No. 10.

d. Reservoir Area. There is an island in the river upstream of the dam with a grove of mature trees established on it, Photo No. 11. An unpaved access road runs along the right bank and a single lane of the N.Y., N.H. & H. Railroad runs along the left bank. Above them, the banks are steep and heavily wooded.

e. Downstream Channel. Glendale Dam was originally used as part of a power supply to mills in the area. At that time, the concrete dam was used to divert flow from the Housatonic River through two 10-ft. by 10-ft. head gates to a channel leading to the power station. Discharge from the reservoir is generally through two 8-ft. by 8-ft. waste outlets and over the spillway during periods of heavy flow.

The total reach investigated for this study extends downstream approximately 2.8 miles to the Route 183 bridge in the Village of Housatonic (Town of Great Barrington). The channel meanders considerably at the upstream end of this reach, but has a better alignment one mile downstream from the dam. The channel varies in width from about 100 ft. at the Route 183 bridge to more than 200 ft. just downstream from the dam. Channel depth varies from approximately 10 ft. to 40 ft. in the reach investigated.

The major structure existing between Glendale Dam and the Route 183 bridge is a single track N.Y., N.H. & H. Railroad Bridge. Although the bridge has two large concrete pier supports in the Housatonic, the river is at one of its widest points at this location.

The Route 183 bridge poses an obstruction to flows in the river. The channel just upstream of the bridge is approximately 125 ft. wide and has extensive development along both banks. The bridge, however, is not the only cause of backwater in the area because the upstream channel is also restrictive.

The most heavily developed area within the reach investigated is in the Village of Housatonic. In that area, there is development on the banks of the channel composed of old mill buildings now used mostly for

stores and repair shops. Beyond the channels' west bank are more businesses and several old, large single-family houses.

Between Housatonic (Village) and the N.Y., N.H. & H. Railroad Bridge is a small cluster of single family houses on the west side of the river. Most are located on ground 10 to 20 ft. above the channel bank elevation.

3.2 Evaluation

Based on the visual examination conducted on 30 May 1979, the Glendale Dam is considered to be in fair condition. Surface deterioration of the concrete is present on the upstream face and especially the downstream face of the dam. Deterioration of the concrete is more extensive at the left abutment wall and the outlet and power channel walls. It is quite apparent that this facility has been neglected from the time it was no longer used as a power source. The level of water behind the dam was about 9.1 below weir crest, which precluded an evaluation of the project at crest overflow. Due to the condition of the dam and the deteriorated joints observed on the upstream face of the spillway, it is recommended that the structure be kept under observation by an Engineer during the closing of the waste outlets and filling of the reservoir.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

In general, there are no formal procedures to provide routine maintenance and satisfactory operation of the dam. The dam has long been neglected. The waste outlet gates have been removed for years and the power channel is not currently in use.

4.2 Maintenance of Dam

There are no established procedures or manuals for periodic inspection and maintenance of the dam. The deteriorated surfaces of the concrete indicate that no maintenance has been performed for some time. Deficiencies noted in prior county and state inspection reports dating back to 1968 are similar in nature to the conditions observed during the site visit of 30 May 1979.

4.3 Maintenance of Operating Facilities

The operating facility appears to have received little to no maintenance for some time. The condition of the facility and recommended repairs are noted in prior inspection reports dating back to 26 August 1968. The reported conditions are similar to present conditions. The present owner indicated that they plan to operate the power station by diverting river flow through the power channel.

4.4 Description of any Warning System in Effect

There is no warning system or emergency preparedness plan in effect for this structure. Mrs. Heather did indicate that the local police and civil defense organization are prepared to evacuate areas along the Housatonic River in the event of flooding.

4.5 Evaluation

The owner should prepare an operations and maintenance manual for the dam. The manual should delineate

the routine operational procedures and maintenance work to be done on the dam to provide satisfactory operation and minimize deterioration of the facility. For example, an annual observation and maintenance program should be established to examine the dam and maintain the gatehouse, gates, operating mechanisms, walls and channels.

Since failure of the dam would possibly cause loss of life and appreciable property damage downstream, the owner should also prepare and implement a formal emergency preparedness plan and warning system.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General. Glendale Dam is a concrete dam on the Housatonic River, originally used as a source of power for local mills. The dam was designed to have the capability to divert flow through a channel to the power station approximately 0.4 miles downstream from the dam. Two waste gates, each 8-ft. by 8-ft., are intended to vary the water level behind the dam. At present, the dam is not being used for power supply, although its owner is making an attempt to make the necessary repairs to once again put it into service.

The two waste outlets are open and the gates have been removed for an apparently prolonged period, as evidenced by scouring of the downstream banks. With the waste outlets open, the river seldom flows over the spillway. Not until the river flow exceeds approximately 3,600 cfs would the river discharge over the spillway with the waste outlets open.

b. Design Data. No hydrologic or hydraulic design data were available for this dam site.

c. Experience Data. Geologic Water-Supply Paper 1671, Magnitude and Frequency of Floods in the United States, presents gage height data on the Housatonic at a point approximately 7 miles downstream from Glendale Dam in Great Barrington, Massachusetts. These data, representing peak stages and discharges for the years 1914 through 1960, show annual high water gage heights that range from 5.0 to 12.08 ft. above datum of El. 683.04 NGVD. The highest stage occurred on 1 January 1949. Peak annual discharges have ranged from between 1,400 and 12,200 cubic feet per second, the latter occurring on 1 January 1949. Although these data are useful in a general sense, gage heights are somewhat biased through the upstream regulation of flow by power plants above the station.

The maximum published flood level in the Housatonic Basin took place in September 1938. A document

prepared by the Massachusetts Geodetic Survey in 1939, entitled High Water Data - Floods of March 1936, and September 1938, presents the Housatonic River profile and noteworthy high water elevations at points along the river. According to this document, the 1938 flood resulted in water surface level of El. 822.8 at the Glendale Road Bridge (known as Butlers Bridge) believed to be approximately 2,000 ft. upstream from Glendale Dam and El. 729 at the Route 183 bridge in the Village of Housatonic. The bridge deck was at El. 732.3.

Mrs. Heather reports that the upstream water surface level at the dam was El. 817 in January 1949. This was confirmed by the Corps of Engineers records of the January 1949 high water elevations which includes a measurement of El. 798.3 at a distance 150 ft. downstream of the dam.

d. Visual Observations. The visual examination of Glendale Dam was made on 30 May 1979. The weather preceding the site visit was characterized by a prolonged rainy period. The height of the water surface behind the dam on that day was approximately 9.1 ft. below the spillway crest. The river flow was passing through the waste outlet and judging by the scouring on the concrete downstream from the dam, this has been the case for several years.

The flow downstream from the dam appeared to be quite turbulent. An island on the left side of the downstream channel had several large trees growing on it. The water on the left side of the island was flowing in the upstream direction. The steep banks of the downstream channel near the dam were overgrown with trees and brush. Farther downstream the banks were similarly overgrown but generally neither as steep nor as high.

All single-family and multi-family homes downstream from the dam, both in Housatonic Village and upstream from it, are apparently occupied. Some of the mill buildings on the west bank in Housatonic are being torn down. Across the river on the east bank, the old buildings have been renovated for use as repair shops, stores, and storage facilities.

e. Test Flood Analysis. The Corps of Engineers' guidelines recommend using a flow between one-half and one times the probable maximum flood (PMF) for "intermediate" size, "significant" hazard potential

dams such as Glendale Dam. For this study, 1/2 PMF was used as the test flood. The PMF was calculated using the Corps of Engineers' Guidelines for Estimating Maximum Probable Discharge in Phase I Dam Safety Investigations. The terrain of the watershed is mostly rolling hills and mountainous terrain, with some low lying flatlands. An inflow rate of 673.6 cfs per square mile was selected for a total watershed of 278.5 square miles, resulting in a PMF of 187,600 cfs and 1/2 PMF of 93,800 cfs.

The test flood outflow, the calculations for which appear in Appendix D, was determined to be approximately 78,400 cfs. This outflow results in a test flood water surface elevation of approximately 16.0 ft. above the top of the dam (left abutment wall) and a tailwater elevation of approximately 8.9 ft. below the spillway crest. The spillway capacity at the top of the dam is approximately 9,360 cfs or 12 percent of the estimated test flood outflow. The waste outlet capacity at test flood elevation is approximately 3,700 cfs or 5 percent of the test flood outflow.

f. Dam Failure Analysis. The peak failure outflow has been calculated using the Corps of Engineers' Guidelines for Estimating Dam Failure Hydrographs. Computations for dam failure analyses appear in Appendix D of this report. It was assumed that the breach length of Glendale Dam is 90 percent of the spillway length at its midpoint, and that the failure occurs when the water surface elevation is at the top of the dam (left abutment wall). Using these assumptions the outflow due to dam failure was calculated to be approximately 49,850 cfs.

An important part of this dam failure study is the condition of water stages prior to actual failure. When the upstream water surface is at the top of the dam, the downstream water surface elevation is almost entirely above the channel banks. This downstream flooding condition prior to failure would probably minimize the hazard to people downstream, because most persons would have evacuated their houses and businesses before the dam failure.

Four reaches were examined between the dam and

the Village of Housatonic. Reach 1 extends 5,400 ft. from the dam to the N.Y., N.H. & H. Railroad Bridge. At the bridge, the flow would be approximately 40,150 cfs and the stage at approximately El. 774.6 NGVD and 5 ft. above the river bank. There is very little development along this reach. Only the power station and the railroad itself would be affected. At the power station, there is a considerable difference between prior flooding and the failure flood wave. The impact would, therefore, be significant if the power station was once again utilized.

Reach 2 extends 2,900 ft. downstream from the railroad bridge. At the downstream end, the water surface elevation is approximately El. 767.2 and the flow is approximately 33,400 cfs. There is very little development throughout this reach.

Reach 3 extends to the northern fringes of the Village of Housatonic. The flow at the downstream end would be approximately 23,900 cfs at approximately El. 765.1. There is some residential development within this area. Approximately 15 single family houses are located along the west bank. The differential between a priori flood elevation and the failure flood wave ranges between 2 and 3 ft. with the stage at 5 to 8 ft. above the river bank.

The height of the failure flood wave would result in flooding of from 1 to 6 ft. at these houses. There is a possibility that some of the houses on higher terrain would not be evacuated prior to failure, yet would be subject to a flood wave. Thus, there is a chance that human life could be jeopardized by flooding from a dam failure.

Reach 4 is that part of the river running through the Village of Housatonic. The downstream flow (at the Route 183 bridge) would be approximately 21,350 cfs with the water surface at approximately El. 724.1. The development in this area is extensive, but the differential between a priori and failure flood stages is only 1 to 2 ft. The downstream part of the reach would have little flooding. The upstream portion has an abandoned mill building and, further from the channel, single-family houses. Risk to human life

is minimized by the initial flooding conditions. Most damage to property would result from flooding before failure.

It should be noted that preliminary calculations were made to investigate the effects of failure at a time when the water surface behind the dam is at the spillway crest and the downstream channel was practically dry. The results showed that, although before failure the water is entirely within the channel, the quantity of failure flood water is stored within the first reach. Therefore, the worst condition is that which has been described in detail in the preceding paragraphs.

In summary, the results of the dam failure analysis indicate that a dam failure has the potential to cause loss of a few lives and appreciable property damage. However, the impact of the flood wave under the worst condition would be lessened by extensive downstream flooding prior to failure. Therefore, the hazard potential classification is considered to be "significant", in accordance with the Corps of Engineers' guidelines.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. There was no visible evidence of major settlement, lateral movement or other obvious signs of structural instability of the concrete dam and spillway. Although local cracking and failures were observed in the canal structures, deterioration of the dam and spillway concrete appear to be confined to concrete surfaces and joints. The extent of the joint deterioration and the depth of the surface deterioration are unknown and therefore their effect on the stability is also unknown. The cross-sections of the dam and spillway appear reasonable and would be expected to be adequately stable under static loading conditions with the impounded water surface at the top of the dam.

Phase I guidelines state that a dam of this size and hazard classification should be checked against, at least, a 1/2 PMF. Approximate calculations indicate the dam would be overtopped by 16 ft. during this flood. Due to the magnitude of the potential overtopping, the unknown depth of the surface deterioration and the unknown extent of the joint deterioration, the structural stability of the dam and spillway must be considered to be questionable.

b. Design and Construction Data. No original design data are known to exist for the dam and outlet works. There is a survey plan available which was prepared in October 1977 by the civil engineering firm of Robert G. Brown & Associates, Inc. However, more detailed information on the foundation would be required for a theoretical structural stability analysis. Therefore, the assessment of the dam for structural stability is based on visual observations.

c. Operating Records. No operating records which would aid in the structural stability evaluation are known to exist. However, stream flow records and verbal reports indicate that the dam experienced water elevation to the top of the dam (1949) and, in recent times with the waste gates open, to an elevation above spillway crest (1979).

d. Post-Construction Changes. No post-construction changes are known to have occurred, other than the gunite treatment applied to the dam in approximately 1946.

e. Seismic Stability. Glendale Dam is located in a Seismic Zone 1 and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination of Glendale Dam revealed that the structure was generally in fair condition. Although there were no signs of impending structural failure or other conditions which would warrant urgent remedial action, it is recommended that the dam be kept under observation by an Engineer during the closing of the waste outlets and filling of the reservoir.

Based on the results of computations included in Appendix D and described in Section 5, the spillway is not capable of passing the test flood, which for this structure is the 1/2 PMF. The test flood outflow of 78,400 cfs (inflow 93,800 cfs or 336.8 csm) would overtop the dam (left abutment wall) by about 16 ft. With the water level at the top of dam, the spillway capacity is about 9,360 cfs, which is 12 percent of the test flood outflow.

b. Adequacy of Information. This evaluation of the dam is based primarily on visual examination, approximate hydraulic and hydrologic computations, consideration of past performance and application of engineering judgement. Generally the information available or obtained was adequate for the purposes of a Phase I assessment. However, it is recommended that additional information regarding the condition, dimensions and structural stability of the dam be obtained, as outlined in Section 7.2.

c. Urgency. The recommendations for additional investigations and remedial measures outlined in Section 7.2 and 7.3, respectively, should be undertaken by the Owner and completed within one year after receipt of this report.

d. Need for Additional Investigation. Additional investigations should be performed by the Owner as outlined in Section 7.2.

7.2 Recommendations

It is recommended that the Owner engage a registered professional engineer knowledgeable and experienced in the investigation, design, construction and regulation of dams to undertake the following investigations:

1. Due to the extensive surficial deterioration of this facility noted during the visual examination and the absence of "as-built" plans, perform a survey and detailed structural examination to determine the geometry and structural condition of the dam and appurtenant structures. Based on the results of this investigation, perform a structural stability analysis and delineate the extent, methods and details of repairs required to safely operate the dam. All repairs required to the upstream face of the dam and other repairs deemed necessary to safely operate the dam should be accomplished prior to closing the waste outlets and filling the reservoir.

2. Perform a detailed hydrologic-hydraulic investigation to determine the need and means of increasing the discharge capabilities at this facility.

The recommended repairs resulting from these engineering investigations may be of a scope and magnitude that requires experienced construction personnel rather than a normal maintenance crew.

7.3 Remedial Measures

a. Operation and Maintenance Procedures. The following should be undertaken by the Owner:

1. Remove the accumulated debris upstream of the outlets at regular intervals.

2. Complete the renovation which is currently underway of the gate house and its operating equipment.

3. Prepare a formal operations and maintenance manual for the dam. The manual should include provisions for regular periodic debris removal, annual technical inspection of the dam and for surveillance of the dam during periods of heavy precipitation and

high river elevations. The procedures should delineate the routine operational procedures and maintenance work to be done on the dam to ensure safe, satisfactory operation and to minimize deterioration of the facility.

4. Develop a written emergency preparedness plan and warning system to be used in the event of impending failure of the dam or other emergency conditions. The plan should be developed in cooperation with local officials and downstream inhabitants.

7.4 Alternatives

In 1976, when the Town of Stockbridge owned Glendale Dam, the Stockbridge Selectmen were considering the possibility of breaching the dam. Copies of correspondence regarding this matter are included in Appendix B, pages B-24 through B-27.

Since the operating facilities are currently being renovated in order to generate electricity at the downstream power station, there are no practical alternatives to the recommended additional investigations and remedial measures.

APPENDIX A - INSPECTION CHECK LIST

Page

VISUAL INSPECTION PARTY ORGANIZATION

NATIONAL DAM INSPECTION PROGRAM

Dam: Glendale

Date: 30 May 1979

Time: 1400-1700

Weather: Partly sunny (light rain earlier in day), temperature 60's F

Water Surface Elevation Upstream: El. 801.8 NGVD (9.1 ft. below top of concrete spillway weir)

Stream Flow: None over spillway, estimated 2,500 cfs through low-level waste outlets

Inspection Party:

Harl P. Aldrich, Jr.	- Soils/Geology
Richard A. Brown Haley & Aldrich, Inc.	
A. Ulvi Gulbey	- Hydraulic/Hydrologic
Robert H. Sheldon	
Robert P. Howard Camp, Dresser & McKee, Inc.	- Structural/Mechanical

Present During Inspection: (Part-time)

Mrs. Mary C. Heather, Housatonic Energy Conservation Association

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Glendale Dam DATE: 30 May 79

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, TRAINING WALLS, APPROACH AND DISCHARGE CHANNELS	
a. Spillway Approach Channel	
General Condition	Satisfactory. Dam extends across full width of Housatonic River. Wooded island with gentle slopes upstream of right abutment of spillway
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	River banks are wooded
Floor of Approach Channel	Submerged
b. Spillway Weir	
General Condition of Concrete	General condition of concrete surface is poor
Flashboards	None observed. Equally spaced pin-holes along crest in some areas
Rust or Staining	Minor rusting and staining observed
Spalling, Voids or Erosion	Extensive spalling and erosion of concrete surface through the down-stream spillway face
Any Visible Reinforcing	Wire mesh exposed at two locations on downstream face
Cracks	Extensive surface cracks on down-stream face. Horizontal crack or cold joint about 4.5 ft. below crest on upstream face observed from left bank
Any Seepage or Efflo-rescence	Minor seepage and efflorescence at cracks
Drain Holes	None observed

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Glendale Dam DATE: 30 May 79

AREA EVALUATED	CONDITION
Condition of Joints	Second joint from right abutment has extensive erosion at tailwater level. Leaking observed at about 9 ft. above tailwater in the first joint (about 19.5 ft.) from left abutment
c. Right Spillway Training Wall (Abutment)	
General Condition of Concrete	General condition of concrete surface is poor
Vegetation	Minor vegetation observed
Seepage or Efflorescence	Minor efflorescence observed
Rusts or Stains	Minor staining observed
Cracks	None observed
Condition of Joints	Fair
Spalling, Voids or Erosion	Extensive spalling and erosion observed
d. Left Spillway Training Wall (Abutment)	
General Condition of Concrete	General condition of concrete surface (gunite) is poor
Cracks	Extensive cracking of gunite surface observed
Seepage or Efflorescence	Extensive efflorescence of wall surface observed. Seepage observed at base of wall
Condition of Joints	Joints covered with gunite
Rust or Stains	Rust and staining observed at wall base
Spalling, Voids or Erosion	None observed
Visible Reinforcement	None observed
e. Spillway Discharge Channel	
General condition	Satisfactory. Discharge over spillway is directed to the Housatonic River

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Glendale Dam DATE: 30 May 79

AREA EVALUATED	CONDITION
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	River banks wooded
Floor of Channel	Submerged
Other Obstructions	Small wooded island near left bank
OUTLET WORKS - INTAKE APPROACH CHANNEL AND TRAINING WALL	
a. Intake Approach Channel	
General	Outlet works adjacent to spillway which extends across full width of Housatonic River
Slope Conditions	Only right bank applicable. Unpaved access road at base of steep wooded slope
Bottom Conditions	Bottom submerged
Rock Slides or Falls	None evident
Log Boom	None present
Debris	Extensive amount of trash floating in channel upstream of outlets
b. Intake Training Wall	
Condition of Concrete	Good
Vegetation	None observed
Seepage or Efflorescence	Seepage observed at wall joint and horizontal crack. Minor efflorescence
Rust or Stains	None observed
Cracks	Horizontal crack at 1/3 point below top of wall
Condition of Joints	Fair
Spalls, Voids or Erosion	None observed
Visible Reinforcement	None observed

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Glendale Dam DATE: 30 May 79

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL STRUCTURE	
a. Gatehouse	
General Condition	General condition of gatehouse is good to fair. Structure is a timber building seated on the concrete substructure. The condition of the main members and sheathing are good while the wood shingles are in need of staining and are considered fair The glazing in the windows have been replaced by movable wooden enclosures. The roof was not observed but no signs of roof leaking were observed
b. Concrete Substructure	
General Condition of Concrete	Fair to poor
Vegetation	Heavy brush growth observed on concrete walls on downstream face just above waste gate openings
Seepage or Efflorescence	Heavy efflorescence observed over downstream face of substructure
Rust of Stains	Rust and staining observed
Cracks	Horizontal cracks or cold joints observed above waste gate openings
Condition of Joints	Joints, in general, are in deteriorated condition
Spalls, Voids or Erosion	Extensive spalling and erosion of concrete surface, joints and or cracks on downstream face above waste gate openings
Visible Reinforcement	None observed
Other	Remaining areas of substructure is good with some staining, spalling and erosion

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

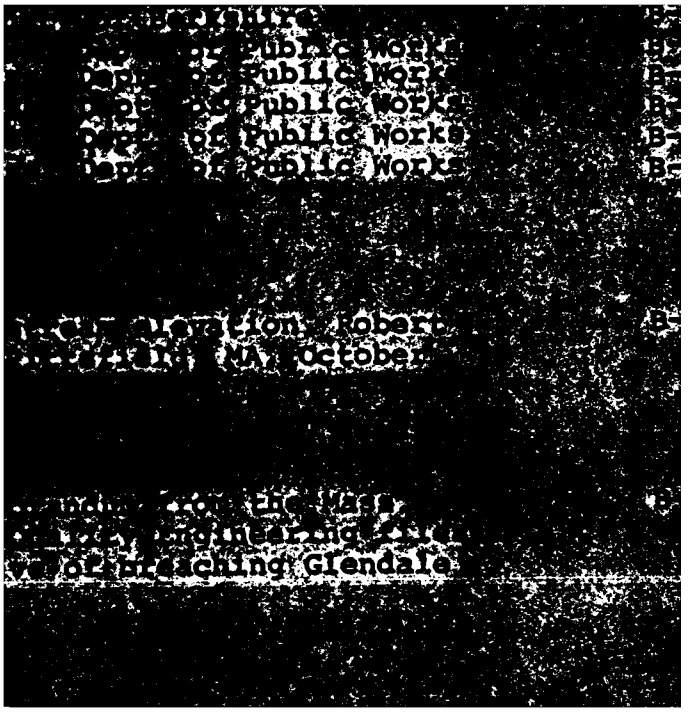
DAM: Glendale Dam DATE: 30 May 79

AREA EVALUATED	CONDITION
c. Mechanical and Electrical	
Head Gates and Operating Mechanisms	Provisions for two (2) double-stemmed, manually-operated rack and pinion geared head gates for the power channel. The right gate was in place and closed while the left gate was missing. The guides for the right gate were rotten and in poor condition. The in-place right gate was also in poor condition. The mechanism for this gate was not operated, but did appear to be in good condition. The remaining power channel outlet gate operating mechanism appeared to be in good condition
Waste Gates and Operating Mechanisms	Provisions for two (2) double-stemmed, manually operated rack and pinion geared gates for the waste way. Neither gate was in-place and the wooden guides were rotten and in poor condition. The waste gate operating mechanisms also appeared to be in good condition. It was noted during the inspection that all the gate operating mechanisms were under repair
Lightning Protection System	None observed
Wiring and Lighting System	None evaluated
Emergency Power System	None observed
OUTLET WORKS - CHANNEL TO POWER STATION	
a. Right Training Wall	
General Condition of Concrete	General condition of concrete is good

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Glendale Dam DATE: 30 May 79

AREA EVALUATED	CONDITION
Vegetation	None observed
Seepage or Efflorescence	Minor efflorescence observed
Rusts or Stains	Some rust and stains observed
Cracks	Minor surface cracking observed
Condition of Joints	Good
Spalling, Voids or Erosion	Minor
Visible Reinforcement	None observed
b. Left Training Wall	
General Condition of Concrete	General condition of concrete is poor
Vegetation	Brush growth in joints
Seepage or Efflorescence	Extensive efflorescence observed
Cracks	Extensive surface cracking observed
Condition of Joints	Poor. Joints are greatly deteriorated and spalled
Spalling, Voids or Erosion	Extensive spalling, erosion and several small voids along both surfaces and the top of training wall
c. Power Channel Downstream of Training Walls	
General Condition	Heavy stone-lined trapizoidal channel is generally in good condition, except on the right side immediately downstream of the concrete training wall. This section of the wall has collapsed, partially blocking the channel
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Heavy tree and brush growth overhanging channel
Floor of Channel	Floor submerged
Other Obstructions	Complete length of channel not observed. May be obstructed in other areas



LIST OF AVAILABLE DATA
GLENDALE DAM

Document	Contents	Location
County inspection report, Glendale Dam	Report dated 26 August 1968	Mass. Dept. of Environmental Quality Engineering, Division of Waterways, 100 Nashua Street, Boston, MA 02114 and page B-2
State inspection reports, Dam No. 1-2-283-2	Five reports from 1971 through 1978, including cover letters and description of dam, if any	Mass. Dept. of Environmental Quality Engineering and pages B-3 through B-22
Exhibit "L", Restoration of Monument Mills Glendale Powerhouse, Robert G. Brown and Associates, Inc., Pittsfield, MA, October 1977	Plan, three sections and downstream elevation prepared for Housatonic Energy Conservation Association	Mrs. Mary Heather, Sergeant Street, Stockbridge, MA 02162 and page B-23
Letters dated 5 April 1976, 12 April 1976 and 5 May 1977. Memorandum dated 4 May 1977	Correspondence on file regarding the alternative of breaching Glendale Dam	Mass. Dept. of Environmental Quality Engineering and pages B-24 through B-27

COUNTY OF BERKSHIRE, MASS.

INSPECTION OF DAMS 1-2-283-2

City or Town of Stockbridge Date August 26/ 1968

Name of Dam Glendale Inspector William A. Heaphy

Owner Town of Stockbridge Address Town Hall, Stockbridge, Mass. Tel.

Caretaker Address Tel.

Location Housatonic River in the town of Glendale (village)

Type and Dimensions Concrete O.C. Gravity type, 200' long, 30' high

Spillway, type and size Concrete, 92' long, 6'3" freeboard.

Outlets, type and size

Flashboards, type and height None

Date Built 1906 Condition Fair

When last repaired 1946 By whose order Owners

Nature of Repairs Gunite treatment on spillway and abutments

Purpose of Dam Formerly power, for generating station downstream.

Approximate storage of water Backs water up about 1 1/2 miles

Approximate area of water shed 274 Square miles

Possible damage due to failure of dam Serious to life and property below

Remarks No water ponded. One draw-off pipe open, Gates to canal closed, stems broken. Gates inoperable. Concrete sidewalls deterioating. Downstream concrete wall cracked.

Recommendations Canal gates should be removed and filled in with concrete. Repair Draw-off gates as required.

File

February 15, 1972

Board of Selectmen
Town of Stockbridge
Town Hall
Stockbridge, Massachusetts

Re: Inspection of Dam #1-2-283-2
Stockbridge
Glendale Dam

Gentlemen:

An engineer from the Department has made an inspection of Glendale Dam in Stockbridge of which the Town of Stockbridge is the owner.

This inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970.

You are hereby directed to:

1. Repair leaking gate.

2. Replace broken gate stem.

3. Replace or repair broken control stems.

4. Remove logs and debris above gates.

5. Repair sidewalls and spillway cracks.

In view of the reported deficiencies of the dam it is strongly urged that the pond or reservoir be drawn down gradually by whatever means possible, and maintained at a safe level so as to reduce the pressures being exerted against the dam. This suggested course of action would undoubtedly provide some measure of relief on the dam during the winter months, until such time as the repair work is completed and the dam made safe.

Board of Selectmen

February 15, 1972

You are reminded that it is the responsibility of the owner of a dam to maintain the structure in good condition so that it is, "sufficiently strong to resist the action of the water under any circumstances which may reasonably be expected to occur", as provided by Section 44 of Chapter 595, Acts of 1970.

An early reply providing a schedule of operations for the necessary work outlined herein is requested, and if further assistance is needed please contact either Fred L. Lehmann, Deputy Chief Engineer or John H. Flaherty, Hydraulic Engineer, for the Division of Waterways.

Very truly yours,

[redacted]
[redacted]

FLL
LHJ
[redacted]

e.c. D. P. Sheldon [redacted]

[redacted]

Dam #26-2

INSPECTION OF DAMS

City or Town of Stockbridge Date May 10, 1971

Name of Dam Glendale Inspector R. Northrup

Owner Town of Stockbridge Address Town Hall, Stockbridge

Caretaker Town of Stockbridge Address Town Hall, Stockbridge

Location In Glendale 0.2 miles south of Glendale-Middle Road behind house on Route 183.

Type of Dimensions Conc. O.G. Gravity Type 200' long, 30' high

Spillway, type and size Conc. 92' long 6'-3" Freeboard

Outlets, type and size Two gates to canal, two gates to river, size 2 (inaccessible)

Flashboards, type and height None

Date Built 1906 Condition Fair

When last repaired 1946 By whose orders Owners

Nature of Repairs Gunite treatment of abutments and spillway.

Purpose of Dam Formerly power.

Approximate storage of water Backs up river 1½ miles.

Approximate area of water shed 274 square miles

Possible damage due to failure of dam Disastrous to life and property below.

Remarks Gates to canal closed, one gate leaking. Stems on one gate broken. Two gates to river open. Control stems broken, considerable logs and debris floating above gates. Water 5 feet below spillway. Spillway face shows spalling. Side walls cracked and spalling.

Recommendations Repairs needed as noted in remarks above.

L-1GB

File
Prev. Ltr. Sent 2-15-72 LRA

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: City/Town Stockbridge. Dam No. 1-2-283-2.
   Name of Dam Glendale. Inspected by: R D Jordan.
   Date of Inspection 11-21/72.

2. Owner/s: per: Assessors_____. Prev. Inspection X.
   Reg. of Deeds_____. Pers. Contact_____.

Name	St. & No.	City/Town	State	Tel. No.
1. Town of Stockbridge		Stockbridge	MA	298-4714
2.				
3.				

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name	St. & No.	City/Town	State	Tel. No.

4. No. of Pictures taken 5.

5. Degree of Hazard: [if dam should fail completely]*

   1. Minor_____. 2. Moderate_____.
   3. Severe_____. 4. Disastrous X.

   *This rating may change as land use changes [future development]

6. Outlet Control: Automatic_____. Manual X.
   Operative_____yes X no.
   Comments:_____

7. Upstream Face of Dam: Condition:
   1. Good X. 2. Minor Repairs_____.
   3. Major Repairs_____. 4. Urgent Repairs_____.
   Comments:_____

L-169 A

DAM NO. 1-2-183-2

8. Downstream Face of Dam: Condition: 1. Good____. 2. Minor Repairs X .
3. Major Repairs___ 4. Urgent Repairs___.

Comments:_____

_____.

9. Emergency Spillway: Condition: 1. Good____. 2. Minor Repairs_____.
3. Major Repairs____. 4. Urgent Repairs____.

Comments:_____

_____

_____

10. Water level @ time of inspection: 4 . ft. above____. below X .
top of dam_____.
principal spillway____x_____.
other_____.

11. Summary of Deficiencies Noted:

Growth [Trees and Brush] on Embankment_____.

Animal Burrows and Washouts_____.

Damage to slopes or top of dam_____.

Cracked or Damaged Masonry X _____.

Evidence of Seepage X _____.

Evidence of Piping_____.

Erosion_____.

Leaks_____.

Trash and/or debris impeding flow X _____.

Clogged or blocked spillway_____.

Other_____.

12. Remarks & Recommendations: [Fully Explain]

No change since 1971 report. The canal gates are closed and inoperative. The river gates are open. There is much trash and debris collected along the entire upstream face of the dam, and some seepage at the toe of the east wall. The wall separating the canal from the river is spalled. The extent of damage could not be determined, due to the heavy water discharge.

The spillway face has areas of minor cracking and the canal and gate wall are cracked and spalling.

In my opinion, the structure is safe, however, repairs should be made before futher deterioration takes place.

13. Overall Condition:

1. Safe_____.
2. Minor repairs needed_____X_____
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists [explain]

   Recommend removal from inspection list_____.

L-169

DESCRIPTION OF DAM

DISTRICT CNE.

Submitted by R D Jordan Dam No. 1-2-283-2

Date 11-21-72. City/Town Stockbridge

Name of Dam Glendale

1. Location—Topo Sheet No: 2-D.

Provide 8-1/2" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year built: 1905. Year/s of subsequent repairs

3. Purpose of Dam: Water Supply. Recreational.

Irrigation. Other Formerly power.

4. Drainage Area: 274 sq. mi. acres.

5. Normal Ponding Area: 1-1/2 mi. river Acres; Ave. Depth.

Impoundment: gals; acre ft.

6. No. and type of dwellings located adjacent to pond or reservoir

i.e. summer homes etc.

7. Dimensions of Dam: Length 200'. Max. Height 30'.

Slopes: Upstream Face vert. conc.

Downstream Face conc.

Width across top.

8. Classification of Dam by Material:

Earth. Conc. Masonry X. Stone Masonry.

Timber. Rockfill. Other.

9. A. Description of present land usage downstream of dam: % rural; 50 % urban.

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure
Yes. No X.

L-169 A

DAM NO. 1-2-293-2

10. Risk to life and property in event of complete failure.

No. of people_____. If the dam failed under a full head, it

No. of homes_____. could possibly destroy Monument Mills Dam –

No. of Businesses_____ and much of the Town of Housatonic.

No. of Industries_____. Type_____.

No. of Utilities_____. Type_____.

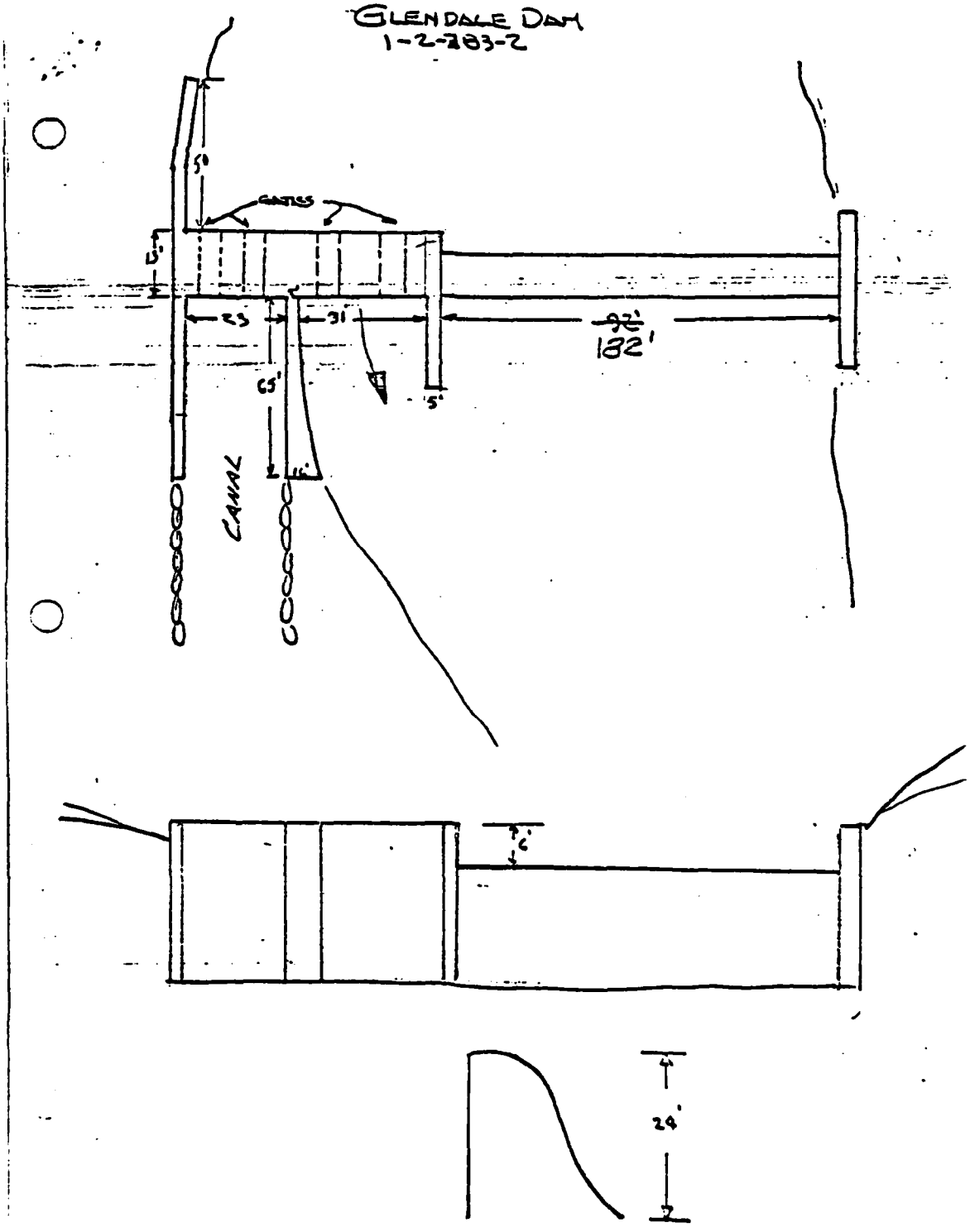
Railroads_____.

Other dams_____.

Other_____.

11. Attach Sketch of dam to this form showing section and plan on 8-1/2" x 11" sheet.

GLENDALE DAM
1-2-283-2



March 27, 1974

Board of Selectmen
Town Hall
Stockbridge, Massachusetts

RE: Inspection - Dam #1-2-283-2
Stockbridge
Glendale Dam

Gentlemen:

On March 7, 1974, an engineer from the Massachusetts Department of Public Works inspected the above dam, owned by the Town of Stockbridge.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970 (Dams - Safety Act).

The results of the inspection indicate that the dam is safe, as it now stands with the reservoir drawn down; however, the following conditions were noted that require attention:

1. Remove the accumulations of debris from around the gates so that their full capacity may be utilized. At the present time this debris is causing an unnecessary backwater condition.

2. Installation of trash racks at the gates is recommended, along with a regular schedule for debris removal.

It is recognized that this dam could provide some measure of flood protection, when properly rehabilitated. To function in this capacity the following repairs should be made:

1. Repair all spalled and deteriorated concrete on the face of the spillway, discharge outlets and channel wall.

2. Repair or replace the inoperative canal gates.

We call these conditions to your attention now, before they become serious and more expensive to correct.

Very truly yours,

F.C. Schweiger

FRED. C. SCHWEIM, P.E.
Deputy Chief Engineer

LRA:jmp
c.c. D.P. Amidon
R. Jordan

L-168

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~City~~/Town STOCKBRIDGE. Dam No. 1-2-283-2.

Name of Dam Glendale. Inspected by: RDJordan-PFFezzie.

Date of Inspection 3-7-74.

2. Prev. Inspection x.

Owner/s: per: Assessors_____.

Reg. of Deeds_____. Pers. Contact_____.

1. Town of Stockbridge Stockbridge, MA 298-4714
Name St. & No. City/Town State Tel. No.

2. _____
Name St. & No. City/Town State Tel. No.

3. _____
Name St. & No. City/Town State Tel. No.

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

_____
Name St. & No. City/Town State Tel. No.

4. No. of Pictures taken 4.

5. Degree of Hazard: [if dam should fail completely]*

1. Minor_____. 2. Moderate_____.

3. Severe_____. 4. Disastrous x.

*This rating may change as land use changes [future development]

6. Outlet Control: Automatic_____. Manual x.

Operative x yes. _____ no.

Comments: canal gates are inoperative

_____

Upstream face of Dam: Condition:

1. Good x. 2. Minor Repairs_____.

3. Major Repairs_____. 4. Urgent Repairs_____.

Comments: _____

_____

_____

L-168 A

DAM NO. 1-2-283-2

8.

Downstream Face of Dam: Condition: 1. Good____. 2. Minor Repairs x.

3. Major Repairs___ 4. Urgent Repairs___.

Comments:_____

_____.

9.

Emergency Spillway: Condition: 1. Good____. 2. Minor Repairs____

3. Major Repairs____. 4. Urgent Repairs____.

Comments:_____

_____

_____

10.

Water level @ time of inspection: 10 ft. above____. below x.

top of dam_____.

principal spillway x.

other_____.

11.

Summary of Deficiencies Noted:

Growth [Trees and Brush] on Embankment_____.

Animal Burrows and Washouts_____.

Damage to slopes or top of dam_____.

Cracked or Damaged Masonry x.

Evidence of Seepage x.

Evidence of Piping_____.

Erosion_____.

Leaks_____.

Trash and/or debris impeding flow x.

Clogged or blocked spillway_____.

Other_____.

12. Remarks & Recommendations: [Fully Explain]

On this date the river gates were open and impoundment was approximately 10' from the spillway crest. There is no visible evidence of any repair work. The general condition is the same as reported in 1972. Although the gates are discharging a large volume of water, considerable debris has collected at the gates. This material should be removed in the near future.

Although this dam is no longer used for power, with proper control it can contribute to flood control. To function in this capacity the following repairs should be made: Repair all spalled and deteriorating concrete on the spillway face, discharge outlets, and discharge channel wall, repair or seal the inoperative canal gates. Remove debris at outlet gates, and install trash racks.

In my opinion, this dam is a very useful structure and efforts should be made to keep it in good condition.

A description of the structure was submitted in 1972. There are no changes to be noted. For location, see Topo 2-D.

13. Overall Condition:

1. Safe X
2. Minor repairs needed_____
3. Conditionally safe - major repairs needed_____
4. Unsafe_____
5. Reservoir impoundment no longer exists [explain]

   Recommend removal from inspection list_____

The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

100 Nashua Street, Boston 02114

March 7, 1977

Town of Stockbridge
Stockbridge, Massachusetts 01262

RE: Insp. Dam #1-2-283-2
Glendale Dam
Stockbridge

Gentlemen:

On Spetember 23, 1976, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be Town of Stockbridge. If this information is incorrect will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dam Safety Act). Chapter 706 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

Trash should be cleaned from in front of the discharge gate.

The concrete adjacent to the discharge gate on the downstream face is cracked and spalling; also minor spalling on the spillway face...these conditions should be corrected.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondance please include the number of the Dam as indicated above.

Very truly yours,

John J. Hannon, P.E.
Chief Engineer

A/c:

cc: Dean Amidon
Robert Jordan
Al McCallum
File

L-108

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~Town~~/Town STOCKBRIDGE. Dam No. 1-2-283-2.

Name of Dam Glendale Dam. Inspected by: RDJordan.

Date of Inspection 9-23-76.

2. Prev. Inspection X.

Owner/s: per: Assessors.

Reg. of Deeds. Pers. Contact.

1. Town of Stockbridge Stockbridge, MA 298-4714
Name St. & No. City/Town State Tel. No.

2. Name St. & No. City/Town State Tel. No.

3. Name St. & No. City/Town State Tel. No.

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name St. & No. City/Town State Tel. No.

4. No. of Pictures taken 3.

5. Degree of Hazard: [if dam should fail completely]*

1. Minor. 2. Moderate.

3. Severe. 4. Disastrous X.

*This rating may change as land use changes [future development]

6. Outlet Control: Automatic. Manual X.

Operative X yes: no.

Comments:

Upstream face of Dam: Condition:

1. Good. 2. Minor Repairs X.

3. Major Repairs. 4. Urgent Repairs.

Comments:

DAM NO. 1-2-283-2

8. Downstream Face of Dam: Condition: 1. Good____. 2. Minor Repairs____.
3. Major Repairs____ 4. Urgent Repairs____.

Comments:_____

_____

9. Emergency Spillway: Condition: 1. Good____. 2. Minor Repairs____.
3. Major Repairs____.4. Urgent Repairs____.

Comments:_____

_____

_____

10. Water level @ time of inspection: 20 ft. above____. below__x__.
top of dam__x__
principal spillway_____.
other_____.

11. Summary of Deficiencies Noted:

Growth [Trees and Brush] on Embankment_____.

Animal Burrows and Washouts_____.

Damage to slopes or top of dam_____.

Cracked or Damaged Masonry_____x_____.

Evidence of Seepage_____.

Evidence of Piping_____.

Erosion_____.

Leaks_____.

Trash and/or debris impeding flow_____x_____.

Clogged or blocked spillway_____.

Other_____.

DAM NO. 1-2-283-2

12. Remarks & Recommendations: [Fully Explain] PREVIOUS INSPECTION DATE: March 3, 1974

On the date of this inspection the gates were open and the water level was approximately 20' below the spillway crest. A great amount of trash was accumulated in front of the discharge gate. This material should be removed.

The upstream face of the concrete dam is in good condition, no cracks or spalls were noted. The concrete adjacent to the discharge gate on the downstream face is cracking and spalling. Also, minor spalling was noted on the spillway face.

The owners should be advised, again, to correct the deficiencies noted.

For location see Topo Sheet 2-D.

---

13. Overall Condition:

1. Safe X.
2. Minor repairs needed X
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists [explain]

   Recommend removal from inspection list_____.

L-168

INSPECTION REPORT - DAMS AND RESERVOIRS

1. ~~Location:~~ City/Town STOCKBRIDGE Dam No. 1-2-283-2

Name of Dam Glendale Inspected by RDJordan - RSpaniol

Date of Inspection August 16, 1978

Previous Inspection September 23, 1976

2. Owner/s per: Assessors _____
Reg.of Deeds _____ Personal Contact _____

1. Mary Heather Sergeant Street Stockbridge _____
Name St. & No. City/Town/State Tel. No.

2. _____
Name St. & No. City/Town /State Tel No.

3. Caretaker (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

_____
Name St.& No. City/Town /State Tel.No.

4. No. of Pictures taken 2

5. Degree of Hazard: (If dam should fail completely)*

1. Minor 2 Moderate _____

3. Severe 4. Disastrous X

*This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual X

Operative _____ Yes _____ No X

Comments: _____

_____

7. Upstream Face of Dam:

Condition: 1. Good X 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

_____

_____

L-168-A

DAM NO. 1-2-283-2

8. Downstream Face of Dam:

Condition: 1. Good _____ 2. Minor Repairs X

3. Major Repairs _____ 4. Urgent Repairs _____

9. Emergency Spillway

Condition: 1. Good _____ 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

_____

10. Water level at time of inspection 18' above _____ below X

top of dam X

principal spillway _____

other _____

11. Summary of Deficiencies Noted:

X Growth (Trees & Brush) on Embankment _____

_____ Animal Burrows and Washouts _____

_____ Damage to slopes or top of dam _____

X Cracked or damaged masonry _____

_____ Evidence of seepage _____

_____ Evidence of piping _____

_____ Erosion _____

_____ Leaks _____

X Trash and/or debris impeding flow _____

_____ Clogged or blocked spillway _____

_____ Other _____

L-168B

DAM NO. 1-2-283-2

12. Remarks & Recommendations; (Fully Explain)

This long neglected structure continues to deteriorate. The face of the ogee spillway has minor spalls and the concrete adjacent to the drawdown gates is spalled and cracked. The concrete wall separating the river channel and the canal leading to the old power station downstream is badly cracked and spalled. The river gates have been removed but the canal gates are in the closed position and inoperable. These gates are badly deteriorated and leak heavily at high water. A huge amount of trash has collected upstream of the gates and it hinders the flow. Some brush and small trees are growing from cracks in the concrete immediately above the river gate outlets.
The owners intend to rehabilitate the power station and generate power. They should be advised to repair the dam before they impound water for that purpose.

For location see Topo Sheet _____.

13. Overall Condition:

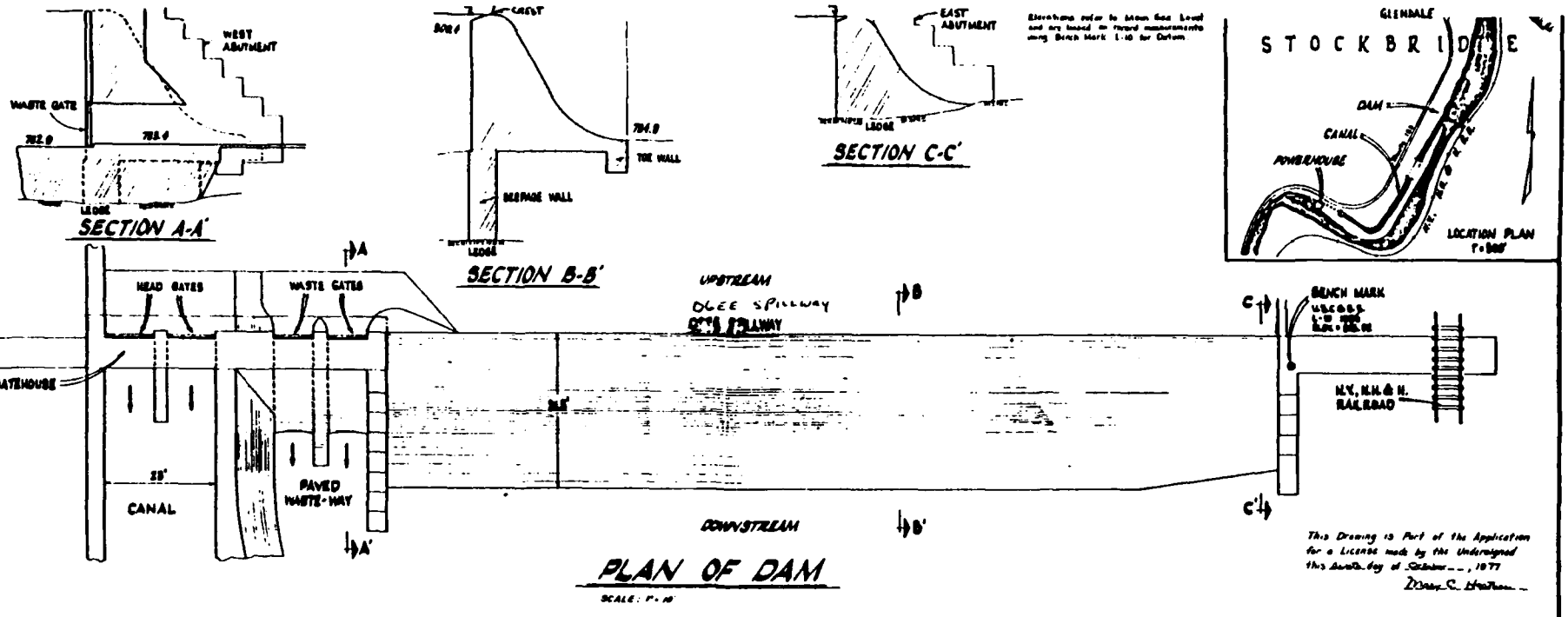
_____ 1. Safe

_____ 2. Minor repairs needed

__X__ 3. Conditionally safe - major repairs needed

_____ 4. Unsafe

_____ 5. Reservoir impoundment no longer esists (explain)
Recommend removal from inspection list



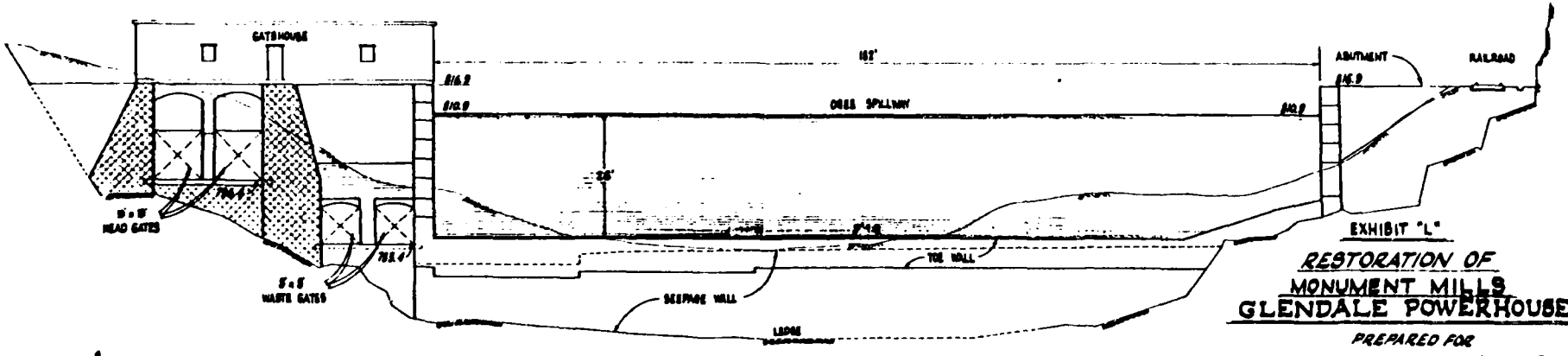


EXHIBIT "L"

RESTORATION OF MONUMENT MILLS GLENDALE POWERHOUSE

PREPARED FOR

HOUSATONIC ENERGY CONSERVATION ASSOCIATION

OCTOBER 1977

Project 2801-1

ROBERT G. BROWN & ASSOCIATES, INC.
CIVIL ENGINEERS • LAND SURVEYORS
Berkshire Common • Third Floor North • Pittsfield, Mass.

Jack Hannon — 4/15
Pls respond for Comm.

The Commonwealth of Massachusetts

Department of Public Works

DISTRICT #1 OFFICE
VETERAN'S MEMORIAL HIGHWAY, LENOX
P.O. BOX 1191, PITTSFIELD 01201

April 12, 1976

DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING
DIVISION OF WATERWAYS
RECEIVED APR 13 1976
Comm Standley

SUBJECT - WATERWAYS - District One
Stockbridge - Glendale Dam
Dam #1-2-283-2

RECEIVED APR 20 1976
A.M.

ATTENTION Mr. John Hannon

Mr. David Standley, Commissioner

Dear Sir

We have enclosed a copy of a letter from a committee appointed by the Stockbridge Selectmen, to investigate the feasibility of breeching the subject dam.

It is the opinion of this office that the breeching of the structure would be detrimental to the area below the dam. This particular dam has a considerable storage capacity and provides good flood control during peak runoff periods. We feel that the low areas of Great Barrington would be in danger of flooding should it be removed.

Therefore, in fairness to all parties concerned, we respectfully request your office to conduct an investigation of this matter to establish a positive course of action.

Very truly yours

Dean P. Amidon, P. E.
District Highway Engineer

RDH:dic
Enclosure
cc JAEzequelle
SurLen

Dist. 1 Corps
Rec'd. 4/9/76

Jonathan A. Ezequelle
P. O. Box 599
Stockbridge, Massachusetts 01262

April 5, 1976

Commenwealth of Massachusetts
Public Works Department
Mr. Robert Jordan
271 Pittsfield Road
Lenox, Massachusetts

Dear Mr. Jordan:

I have been appointed, by the Stockbridge Selectmen, to chair a committee of residents to investigate: a. the possibility of breaching the Glendale Dam and; b. the possible demolition or disposal of the Glendale Powerhouse.

Any help or advise you might offer us, pursuant to our meeting on April 1, 1976, regarding either a. or b. above would be greatly appreciated.

Sincerely yours,

Jonathan Ezequelle

Jonathan A. Ezequelle

NED Dist. 1
Ans.
Read by Circ.
APR 8 1976
Disposition
File

The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

100 Nashua Street, Boston 02114

May 5, 1977

Representative Sidney Q. Curtis
Massachusetts House of Representatives
House Chambers
State House
Boston, Mass.

Re: Status on Dams

Dear Representative Curtis:

At a recent meeting with Representative Joseph S. Scelsi and company, the Dams Safety Act of 1970 and subsequent associated legislation was discussed in detail.

At that meeting questions were asked about dams within the Berkshire County that were of special interest to you.

Appended please find a memorandum on the status of those dams that may be of interest to you.

Should additional information be desirable, please contact me in Boston at 727-4796.

Very truly yours,

JOHN J. HANNON, P.E.
Chief Engineer

JJh:eh

M E M O R A N D U M

TO: JOHN J. HANNON, CHIEF ENGINEER
FROM: EDWARD H. MACDONALD EHM
DATE: MAY 4, 1977

SUBJECT: STATUS - CERTAIN DAMS

The following information is provided as requested;

New Marlboro - York Pond Dam - #1-2-283-2

Dam rated safe in 1973 but in need of repairs. Inspection of 1975 same conditions. Scheduled for reinspection sometime this month (May 1977)

Owner: Dept. of Natural REsources
18 Ashburton Place
Boston

Caretaker: Carl Cutlin
State Forest Office
Pittsfield

Sheffield (Ashley Falls) - Housatonic River - (No Dam #)

Telephone conversation with Bob Jordan, Dist. #1 Dams & Reservoir Engineer indicated there are two (2) small dams in the area but are not on the inventory list. Bob Jordan is in the process of arranging a meeting with owners and complaintants.

Stockbridge - Glendale Dam #1-2-283-2

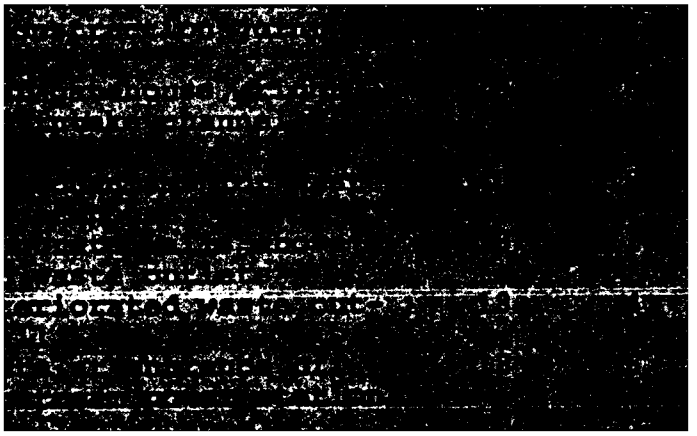
Dam rated safe, minor repairs needed after inspection of Sept. 23, 1976. Rating was based on drawndown condition, waterlevel was 20' below the top of dam.

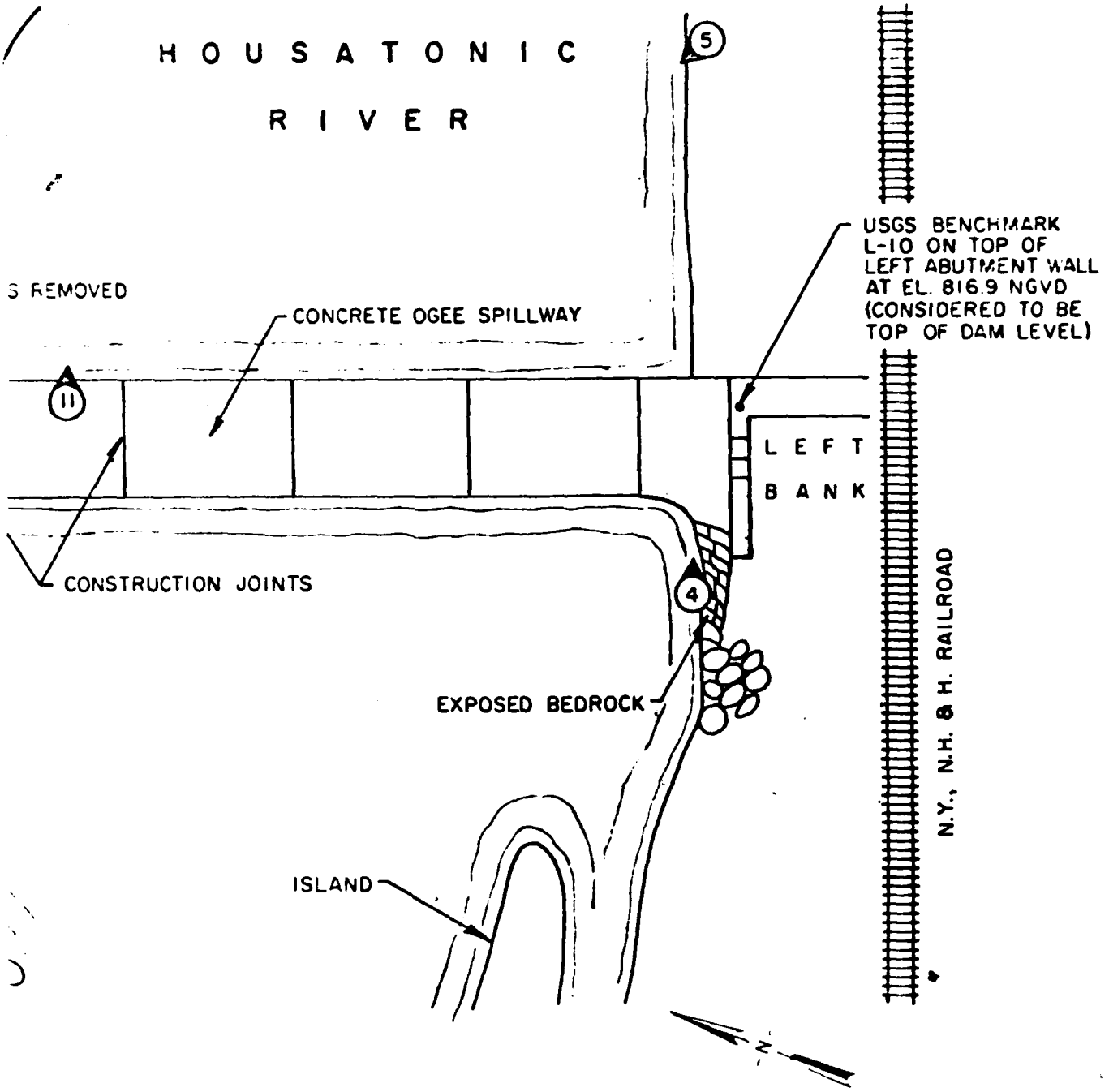
Owner: Town of Stockbridge
Town Hall, Stockbridge

Caretaker: Same

The Town of Stockbridge appointed a committee to investigate possibility of breaching this dam. (see April 5, 1976 letter attached). Dist. Highway Engineer opposed breaching in letter dated Apr. 12, 1976 (see copy enclosed) because of its storage capacity and flood control potential. No action, either repair or breach, has taken place to the district's knowledge as of Apr. 28, 1977

EHM:eh
Attach:
cc: Al McCallum

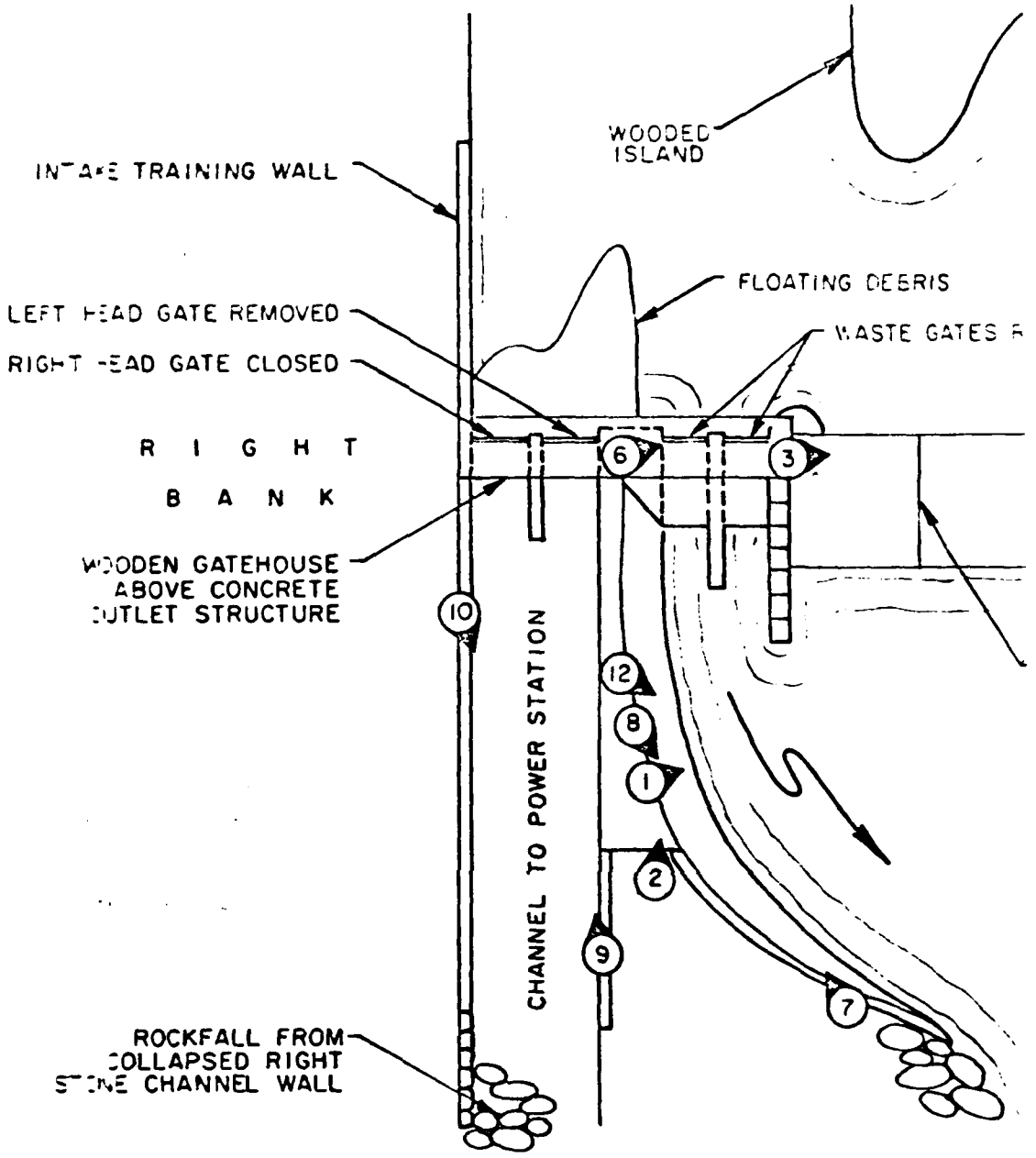




Glendale Dam
Stockbridge, MA

SITE PLAN SKETCH

Approx. Scale: 1"=30' August 1979



NOTE

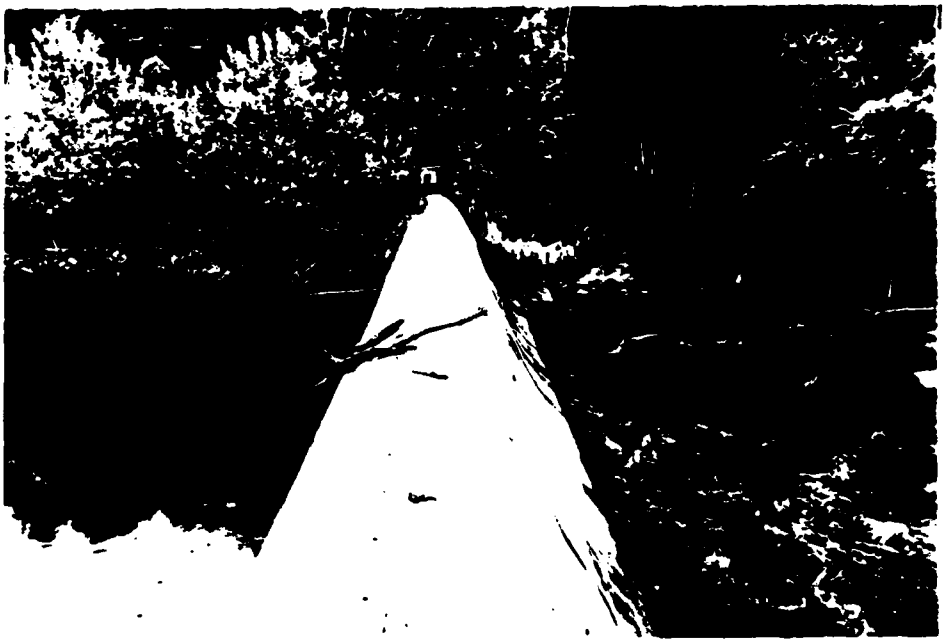
PLAN DEVELOPED FROM DRAWING ENTITLED EXHIBIT "L", RESTORATION OF MONUMENT MILLS GLENDALE POWERHOUSE (SEE PAGE B-23) AND FIELD OBSERVATIONS MADE ON 30 MAY 1979

LEGEND

(6) PHOTO NO. AND DIRECTION OF VIEW

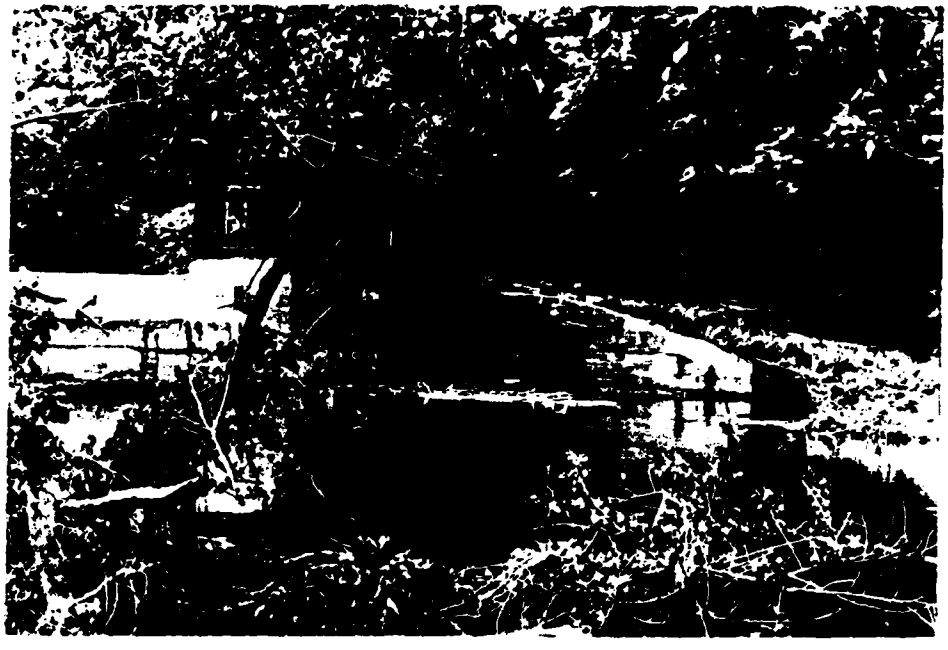
HALEY & ALDRICH, INC
CAMBRIDGE MASSACHUSETTS

FILE NO. 4270 842

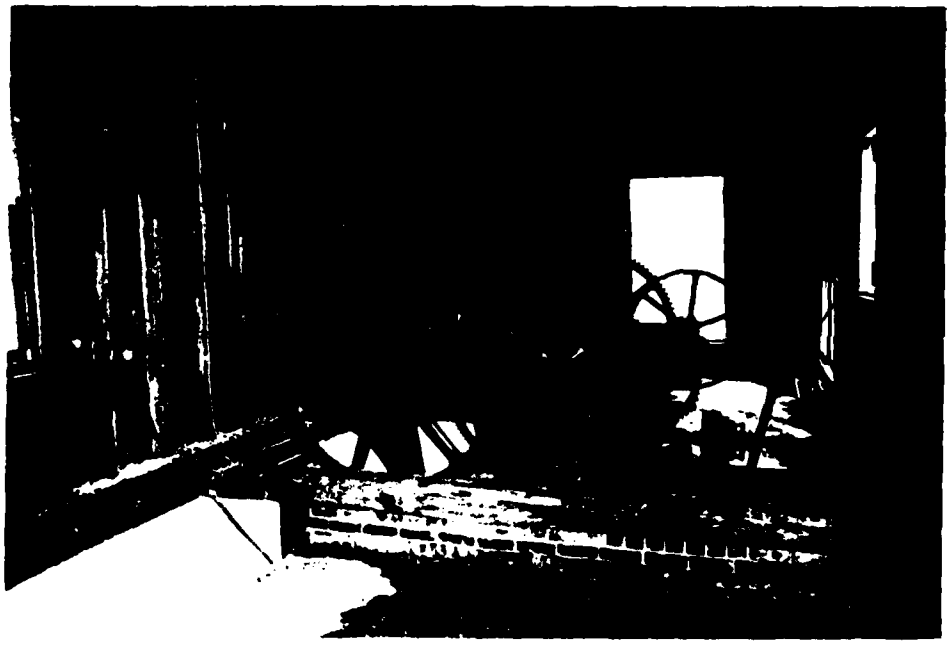


3. View along axis of spillway and left abutment

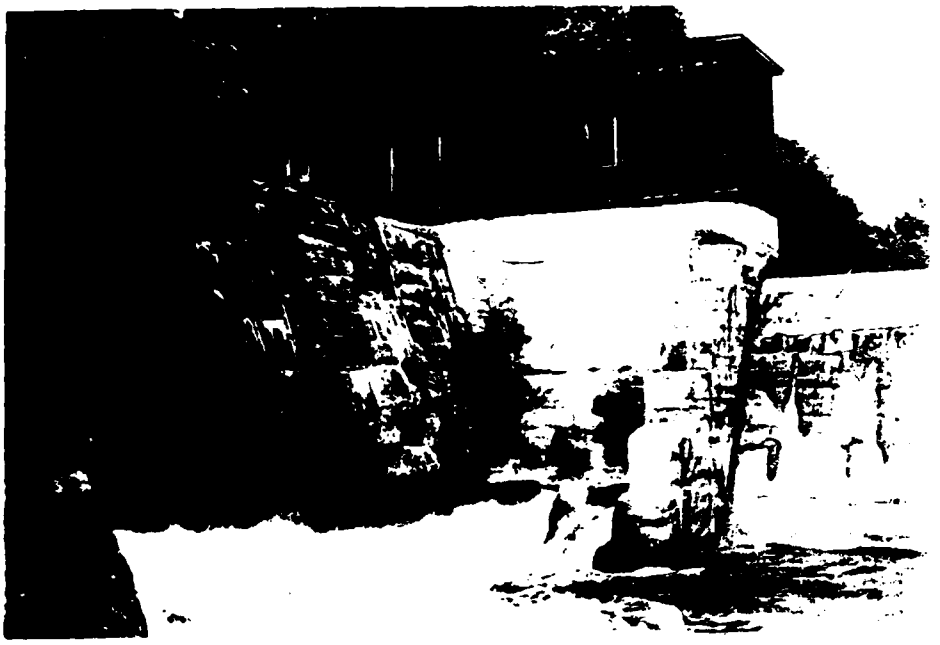
4. Seepage at base of left abutment wall and from construction joint in spillway



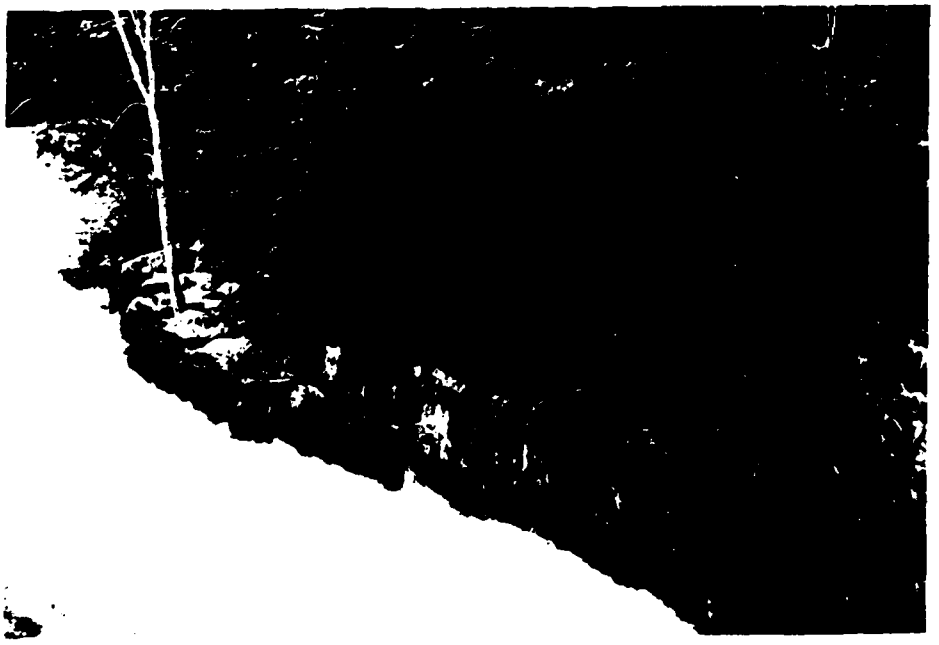
5. Upstream side of gatehouse, right side of dam and intake channel training wall



6. Gate operating mechanisms for waste outlets inside gatehouse

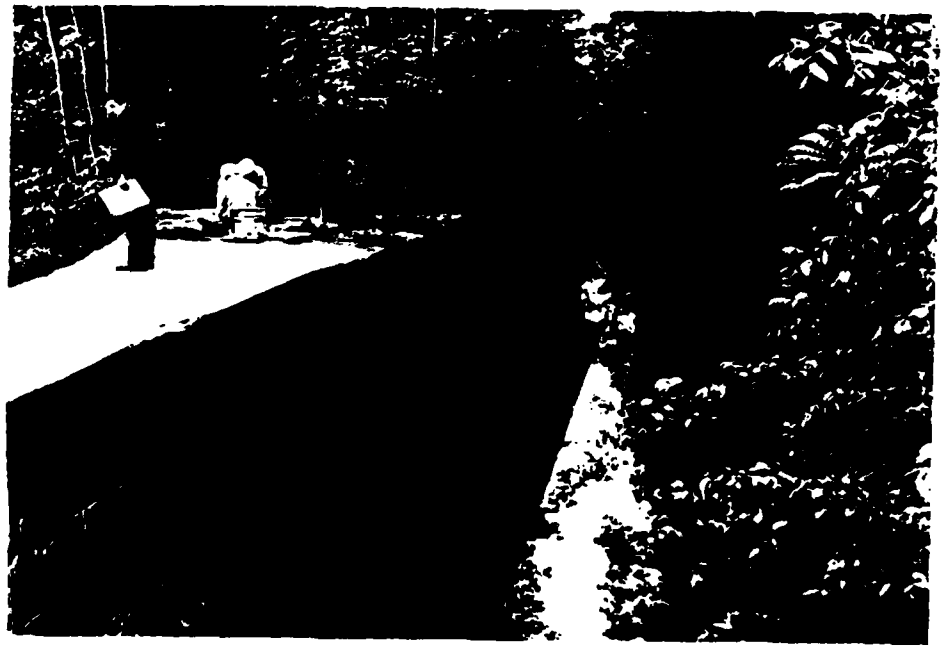


7. Deteriorated concrete walls above and adjacent to waste outlets



8. Cracked and deteriorated waste outlet training wall

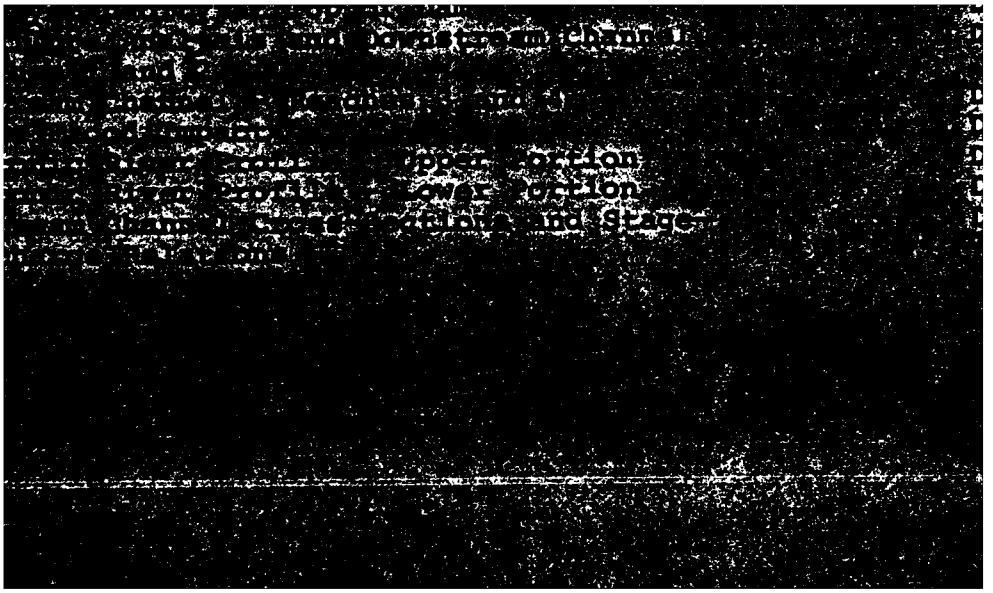
9. Head gate outlets at entrance of channel to downstream power station



10. Left training wall of channel to power station. Note rockfall where right channel wall has collapsed

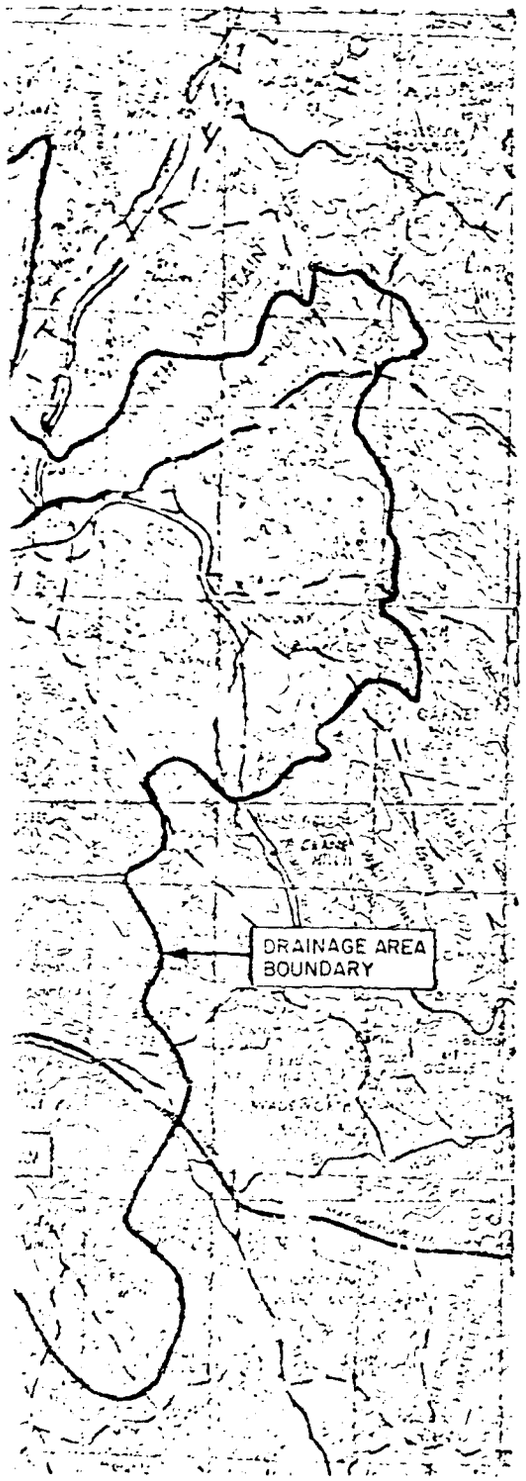
11. Housatonic River upstream from dam

12. Housatonic River downstream from dam

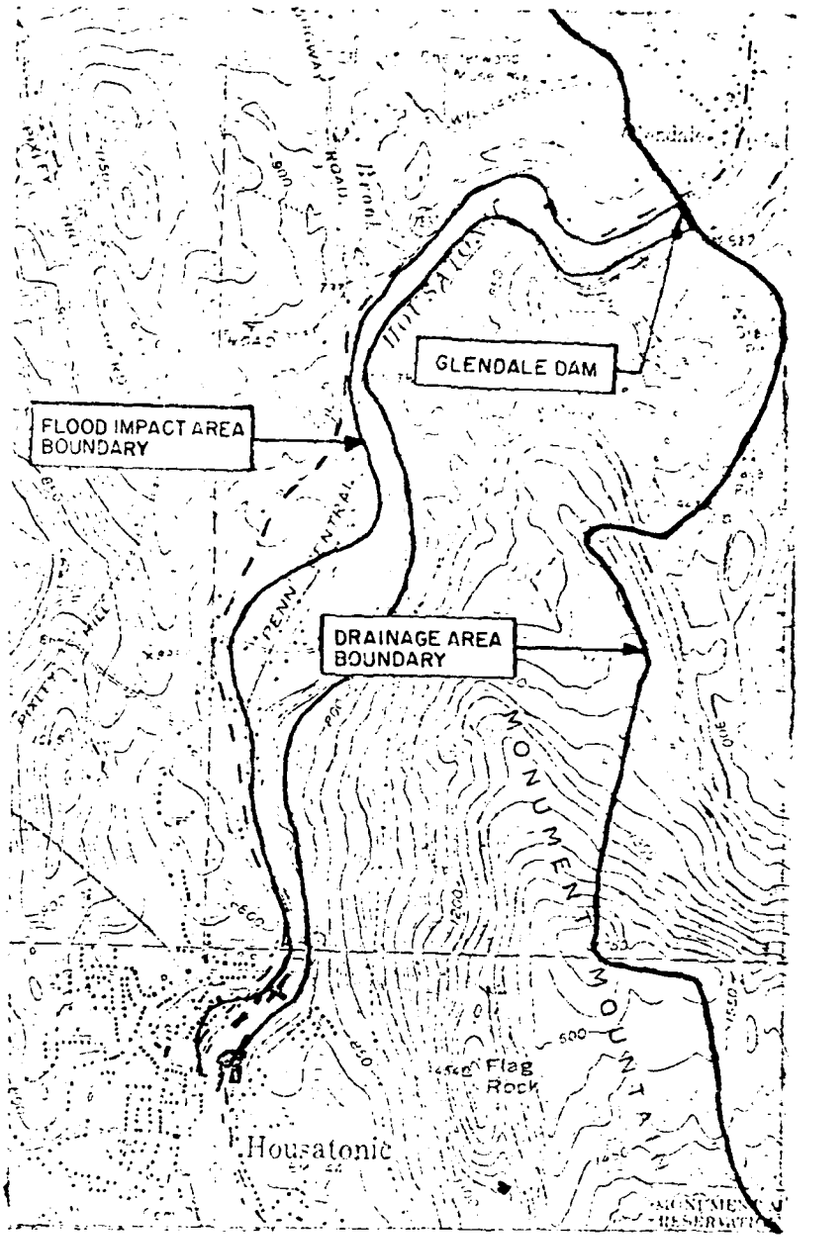


SCALE : 1:250,00

CAMP DRESSER & McKEE Inc.
Consulting Engineers
Boston, Mass.



1:250,000



INSET A
SCALE: 1: 24,000

KEE Inc.
neers

GLENDALE DAM
DRAINAGE AREA AND
FLOOD IMPACT AREA
SCALES: AS SHOWN

D-1

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam Stockbridge

JOB NO 561-9-RI-02
DATE CHECKED 8/7/79
CHECKED BY AWG

PAGE 1
DATE 7/11/79
COMPUTED BY RMS

Size Classification

Height of dam = 816.9 - 810.9 + 26 = 32.0' < 40' (Small)

Storage at top of dam = 2550 acre-feet > 1000 acre-feet (Intermediate)
(See Area-Volume, page D-5)

Size Classification: INTERMEDIATE

Hazard Potential

Development downstream from the Glendale Dam is extensive. Insufficient channel capacity results in flooding conditions in developed areas in spite of these areas being located up to three miles downstream from the dam. During a dam failure, single-family dwellings, commercial buildings, part of Route 183, and other important developments are expected to be flooded. However, before dam failure, the river would already be over its banks. This a priori condition would be expected to furnish warning to those who are downstream. There would still be potential for loss of lives, although few, and damage to property. The hazard potential classification is therefore "Significant."

Test Flood

Drainage Area = 178,240 acres = 278.5 sq.mi.

Composition of terrain (from U.S.G.S. topographic maps)

Mountainous	45%
Rolling	49%
Low-lying flat	6%

From COE Guidelines:

$$PMF = 278.5\left((0.06\times 285)+(0.49\times 630)+(0.45\times 815)\right)$$
$$= 278.5 \text{ sq. mi.} \times 673.65 \text{ cfs/sq. mi.}$$
$$= 187{,}612 \text{ cfs}$$

Test Flood Inflow: "Significant" hazard and "intermediate" size dam

Use $\frac{1}{2}$ PMF for further studies (= 93,806 cfs)

CAMP DRESSER & McKEE Environmental Engineers Boston, Mass.

CLIENT Haley and Aldrich | JOB NO 561-9-Rt-02 | PAGE 2
PROJECT COE Dam Inspections | DATE CHECKED 8/7/79 | DATE 7/16/79
DETAIL Glendale Dam - Stockbridge | CHECKED BY MLG | COMPUTED BY RHS

Surcharge Storage Routing

Assumed that waste gates are open and power channel (head) gates are closed.
Assumed that normal pond WSE = 801.8 ft. (the level witnessed on day of field inspection)

Test Flood Inflow = 93,806 cfs
WSE @ Glendale Dam @ 93,806 cfs = 835.7 ft. (See stage-discharge, page D-4)
Volume @ Glendale Dam @ 835.7 ft. = 27,100 ac.-ft. (See area-volume, page D-5)

Normal Pond Volume @ 801.8 ft. = 40 ac-ft. (See stage-discharge, page D-6)

$STOR1 = \left(\frac{27,100-40}{178,240}\right) \times 12 = 1.82$ in.
Trial $Q_{p2} = 93,806\left(1-\frac{1.82}{9.5}\right) = 75,835$ cfs → WSE = 832.1; Vol. = 20,000 ac.-ft.
$STOR2 = \left(\frac{20,000-40}{178,240}\right) \times 12 = 1.34$ in
$STOR_{ave} = 1.58$ in.

$Q_{p3} = 93,806\left(1-\frac{1.58}{9.5}\right) = 78,205$ cfs → WSE = 832.8; Vol. = 21,200 ac.-ft.
$STOR3 = \left(\frac{21,200-40}{178,240}\right) \times 12 = 1.42$ in
$STOR_{ave} = 1.5$

$Q_{p4} = 93,806\left(1-\frac{1.5}{9.5}\right) = 78,995$ cfs → WSE = 833.0; Vol. = 24,000 ac.-ft.
$STOR4 = \left(\frac{24,000-40}{178,240}\right) \times 12 = 1.61$ in
$STOR_{ave} = 1.56$ in

$Q_{p5} = 93,806\left(1-\frac{1.56}{9.5}\right) = 78,402$ cfs → WSE = 832.9; Vol. = 23,000 ac.-ft.
$STOR5 = \left(\frac{23,000-40}{178,240}\right) \times 12 = 1.55$

$STOR_{ave} \cong STOR5$

Test Flood Outflow = 78,400 cfs

Pond WSE = 832.9 ft.

Test Flood WSE is 16.0 ft. above top of dam.

Tailwater

Q = 78,400 cfs
Tailwater WSE at dam = 802.0 ft. (See stage-discharge, page D-7)

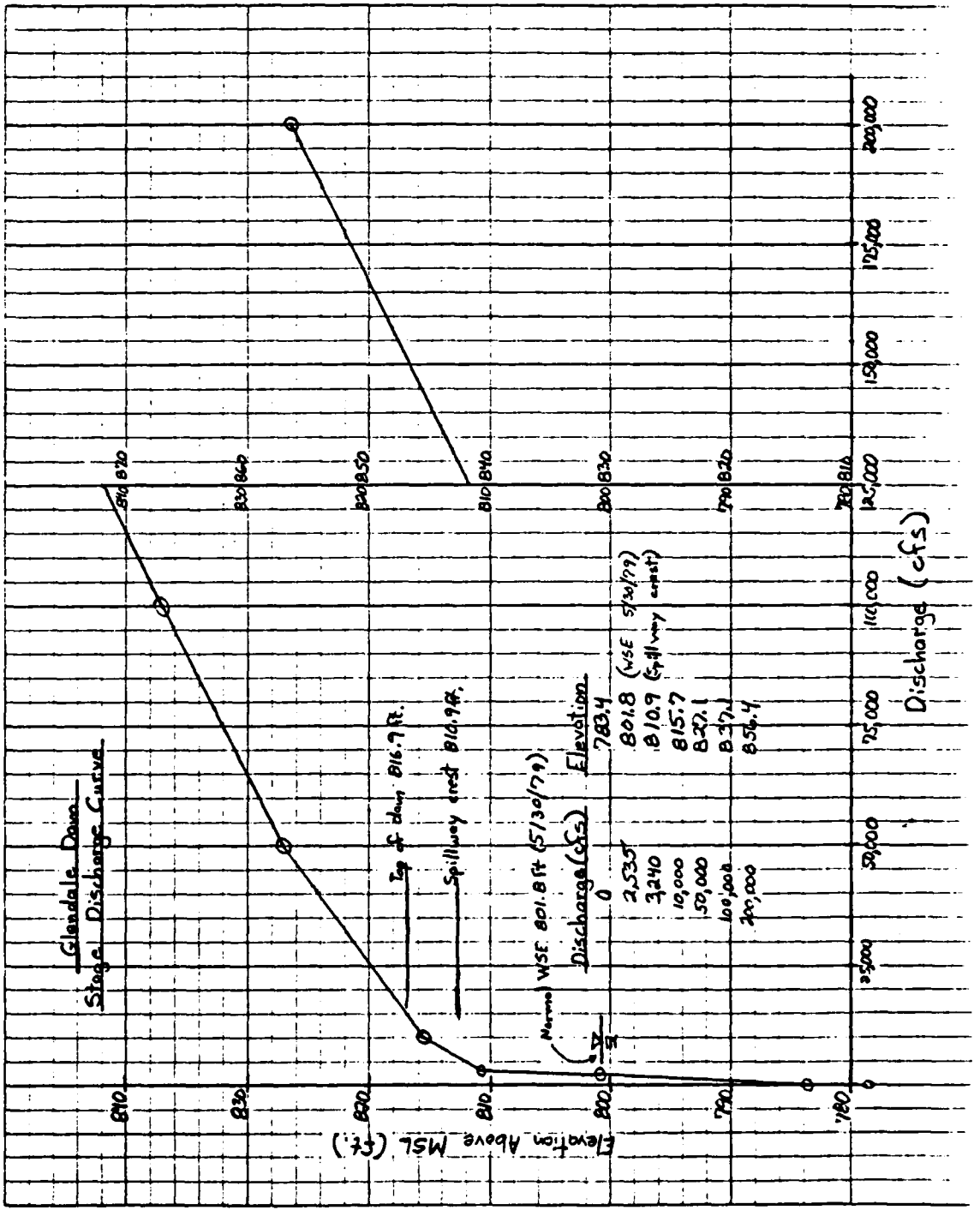
802.0 ft. < 810.9, ele. of spillway crest.
Spillway would not be submerged.

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-RT-02
DATE CHECKED 8/7/79
CHECKED BY AHG

PAGE 3
DATE 7/11/79
COMPUTED BY RHS



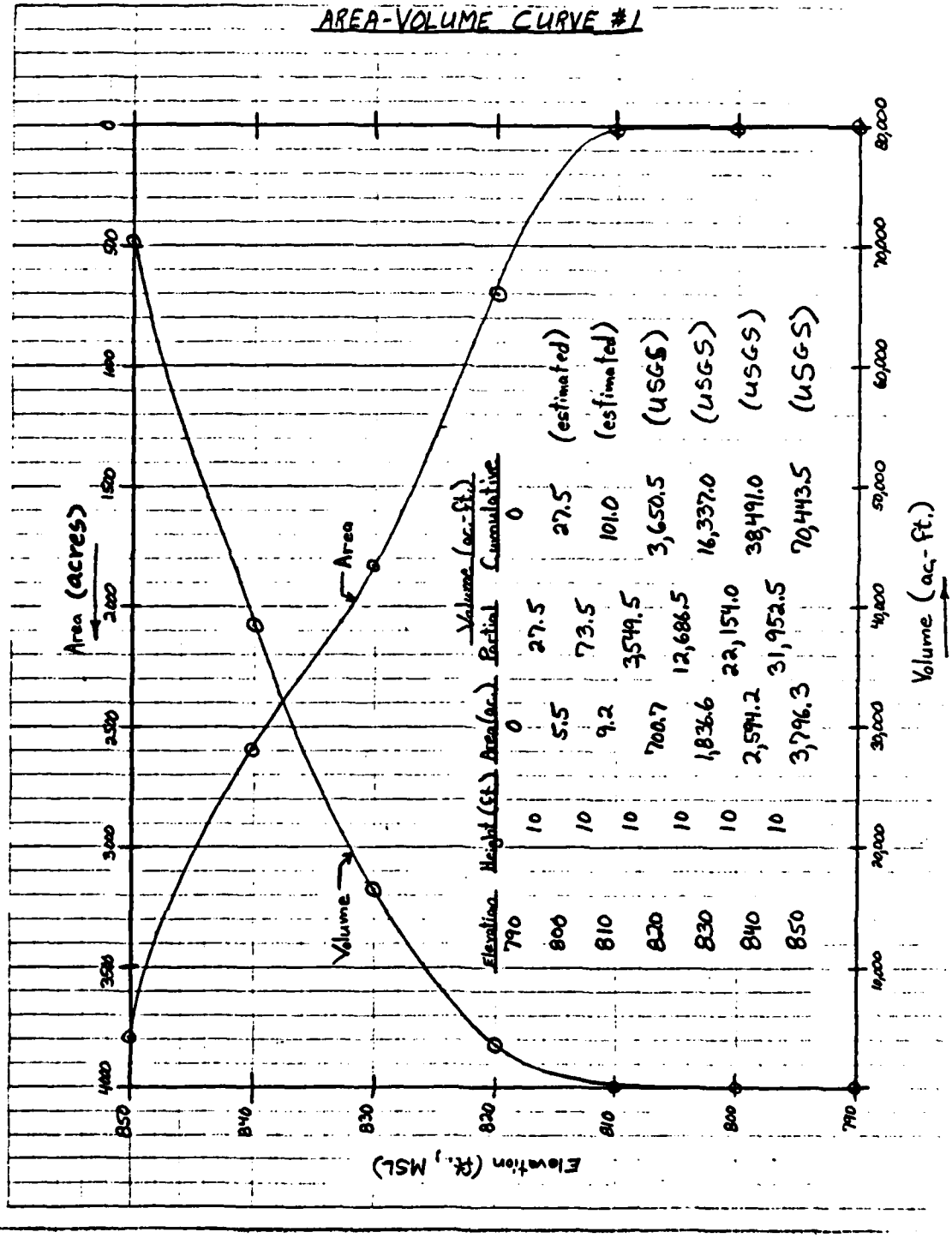
CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-Rt-2
DATE CHECKED 8/7/79
CHECKED BY AVC

PAGE 4
DATE 6/21/79
COMPUTED BY RHS

AREA-VOLUME CURVE #1



Elevation	Height (ft)	Area (ac.)	Volume (ac.-ft.) Partial	Cumulative	
790		0		0	
800	10	5.5	27.5	27.5	(estimated)
810	10	9.2	73.5	101.0	(estimated)
820	10	700.7	3549.5	3,650.5	(USGS)
830	10	1,836.6	12,686.5	16,337.0	(USGS)
840	10	2,594.2	22,154.0	38,491.0	(USGS)
850	10	3,796.3	31,952.5	70,443.5	(USGS)

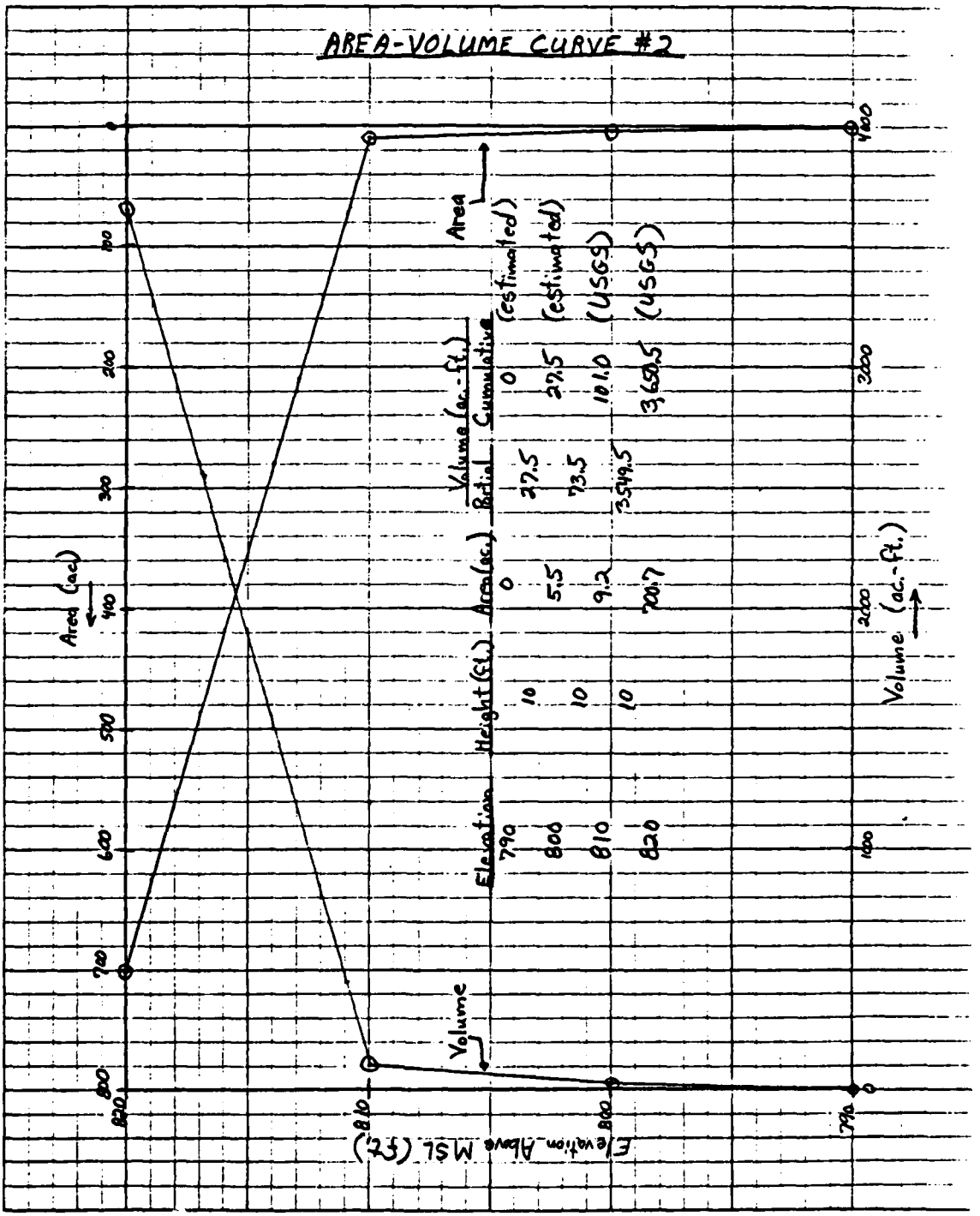
CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-R1-02
DATE CHECKED 8/7/79
CHECKED BY AJL

PAGE 5
DATE 7/11/79
COMPUTED BY F.M.S

AREA-VOLUME CURVE #2



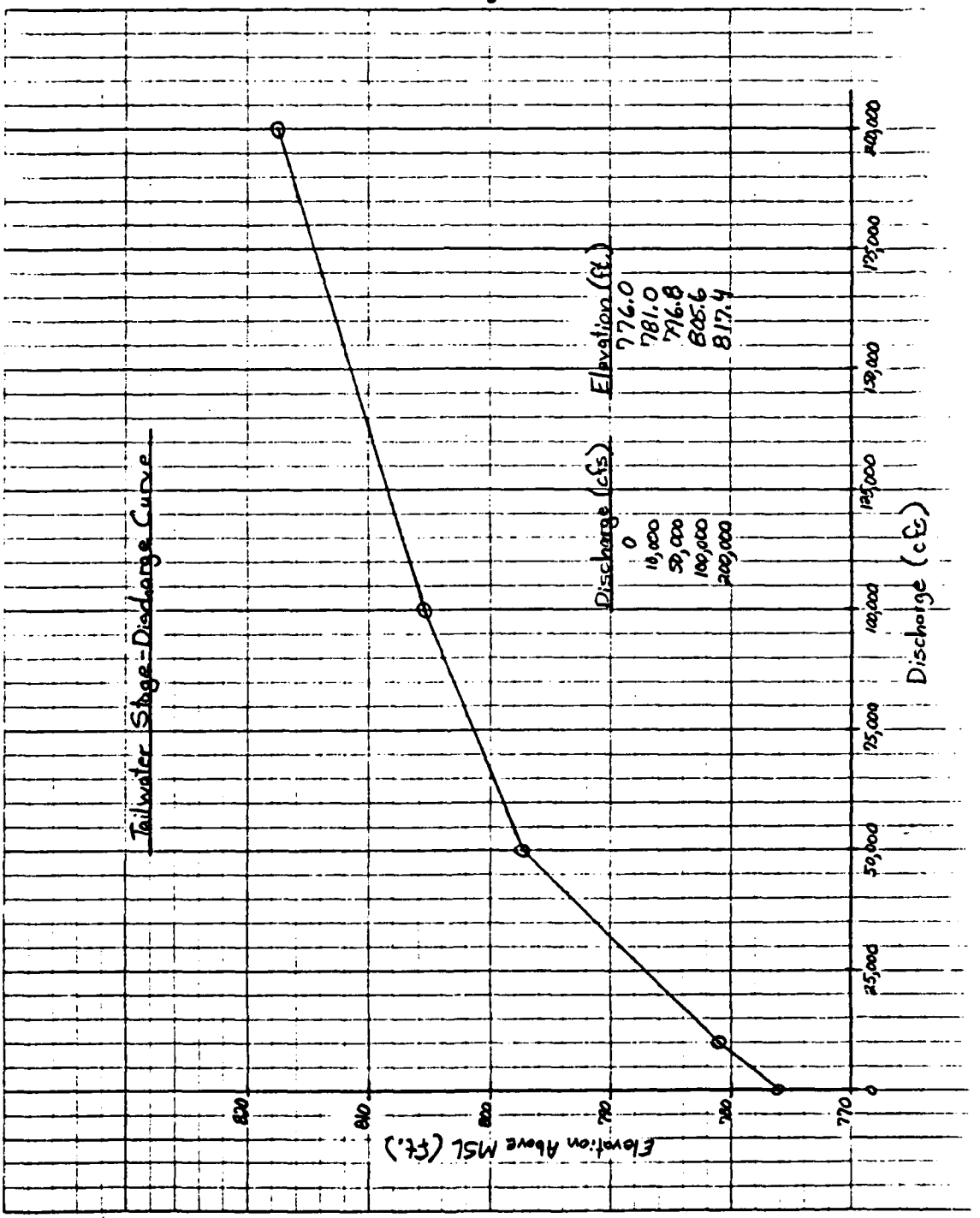
Elevation	Height (ft.)	Area (ac.)	Volume (ac.-ft.) Partial	Volume (ac.-ft.) Cumulative	
790		0		0	(estimated)
800	10	5.5	27.5	27.5	(estimated)
810	10	9.2	73.5	101.0	(USGS)
820	10	20.7	349.5	3,698.5	(USGS)

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

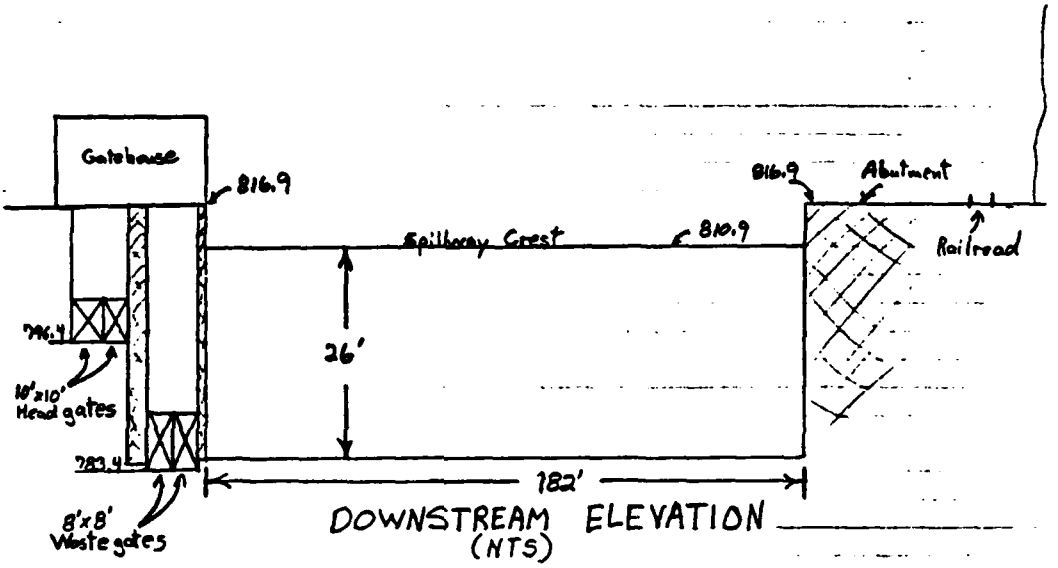
CLIENT Holey and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-RT-02
DATE CHECKED 8/7/79
CHECKED BY AHG

PAGE 6
DATE 7/11/79
COMPUTED BY RMS



Spillway Capacity



DOWNSTREAM ELEVATION
(NTS)

At Test Flood Pool Elevation

Spillway capacity calculations are made assuming that the waste gates are open and head gates are closed.

Formula for waste gates : $Q = 0.65\sqrt{2gh}\,A$
Formula for spillway : $Q = 3.5 \times L \times H^{3/2}$

Under test flood conditions,

$Q_{\text{WASTE GATES}} = 0.65 \times 764.4 \times (832.9 - 802.0) \times 128 = 3710$ cfs

$Q_{\text{SPILLWAY}} = 3.5 \times 182 \times (832.9 - 810.9)^{3/2} = 65{,}730$ cfs

$Q_{\text{TEST FLOOD OUTFLOW}} = 78{,}400$ cfs

Flow over banks (around spillway area) = 78,400 − 65,730 − 3,710
= 8,960 cfs

Flow over spillway = $\frac{65{,}730}{78{,}400} = 0.84 = 84\%$ of test flood outflow.

Flow through waste outlets = $\frac{3710}{78{,}400} = 0.05 = 5\%$ of test flood outflow.

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich JOB NO 561-9-RT-02 PAGE 8
PROJECT COE Dam Inspections DATE CHECKED 8/7/79 DATE 8/6/79
DETAIL Glendale Dam - Stockbridge CHECKED BY MLC COMPUTED BY RHS

Spillway Capacity at Top of Dam

$Q_{SPILLWAY} = 3.5(182)(816.9-810.9)^{3/2} = 9360$ cfs

Capacity $= \frac{9360}{78,400} = 12\%$ of test flood outflow.

Flow through waste outlet:

$Q = 0.65\sqrt{64.4 \times (816.9-787.4)} \times 2 \times 64 = 3630$ cfs

$\Sigma Q = 9360 + 3630 = 12,990$ cfs

say 13,000 cfs

Capacity of combination of spillway and waste gates:

$\frac{13,000}{78,400} = 16.6\%$ of test flood outflow

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich JOB NO 561-9-FA-02 PAGE 9
PROJECT COE Dam Inspections DATE CHECKED 8/7/79 DATE 7/11/79
DETAIL Glendale Dam-Stockbridge CHECKED BY AMG COMPUTED BY RMS

Dam Failure Analysis

$Q_{P1} = 8/27\ W_b \sqrt{g}\ Y^{1.5}$

Assume: 1. Dam fails when WSE = 816.9 (at top of dam)
2. Flow before failure = 13,000 cfs
3. Breach width = 90% of mid-height of spillway structure
4. Height of dam = 32 feet
5. Storage at failure = 2550 acre-feet

$Q_{P1} = 8/27 \times 0.9 \times 182 \times \sqrt{32.2} \times 32^{1.5} = 49,853$ cfs

Downstream Channel

Reach 1: Glendale Dam to Railroad bridge (Sta 96+00)

$Q_{P1} = 49,853$ cfs
Distance = 5400 feet
Downstream WSE = 776.3 A = 4400 s.f.
S = 2550 ac-ft
Upstream Area = 4000 s.f.
$V_1 = 5400\left(\frac{4000+4400}{2}\right)\frac{1}{43560} = 521$ ac.-ft.
$Q_{P2}(\text{trial}) = 49853\left(1-\frac{521}{2550}\right) = 39,667$ cfs → WSE = 774.3 ; A = 3600 s.f.
$V_2 = 5400\left(\frac{4000+3600}{2}\right)\left(\frac{1}{43560}\right) = 471$ ac.-ft.
$V_{ave} = 496$ ac.-ft.
$Q_{P2} = 49,853\left(1-\frac{496}{2550}\right) = 40,156$ cfs → WSE = 774.6 ; A = 3600 s.f.

At railroad bridge, WSE = 774.6 and Q = 40,156 cfs

Reach 2: Railroad bridge to Sta 67+00

Distance = 2900 ft.
S = 2550 − 496 = 2054 ac.-ft.
$Q_{P1} = 40,156$ cfs
Downstream WSE = 768.2 ; Area = 7100 s.f.
$V_1 = 2900\left(\frac{7100+3600}{2}\right)\frac{1}{43560} = 356$ ac.-ft.
$Q_{P2}(\text{trial}) = 40,156\left(1-\frac{356}{2054}\right) = 33,196$ cfs → WSE = 767.2 ; A = 6500 s.f.
$V_2 = 2900\left(\frac{6500+3600}{2}\right)\frac{1}{43560} = 336$ ac.-ft.
$V_{ave} = 346$ ac.-ft.
$Q_{P2} = 40,156\left(1-\frac{346}{2054}\right) = 33,392$ cfs → WSE = 767.2

At Sta 67+00, WSE = 767.2, Q = 33,392 cfs

Reach 3: Sta 67+00 to Sta 30+00

Distance = 3700 ft.

$S = 2054 - 346 = 1708$ ac.-ft.

$Q_{P1} = 33,392$

Downstream WSE = 766.2 ; Area = 5,000 s.f.

$V_1 = 3700\left(\frac{5000+6500}{2}\right)\frac{1}{43560} = 488$ ac.-ft.

Q_{P2} (trial) $= 33,392\left(1-\frac{488}{1708}\right) = 23,851$ cfs → WSE = 765.6; Area = 4910 sf.

$V_2 = 3700\left(\frac{4910+6500}{2}\right)\frac{1}{43560} = 484$ ac.-ft.

$V_{ave} = 486$

$Q_{P2} = 33,392\left(1-\frac{486}{1708}\right) = 23,891$ cfs → WSE = 765.6

$V_3 \cong V_2$

At Sta 30+00, WSE = 765.6 ft. and Q = 23,891

Reach 4: Sta 30+00 to Sta 10+00

Distance = 2000 ft.

$S = 1708 - 484 = 1224$ ac.-ft.

$Q_{P1} = 23,891$ cfs

Downstream WSE = 724.5 ; Area = 760 sf.

$V_1 = 2000\left(\frac{760+4900}{2}\right)\frac{1}{43560} = 130$ ac.-ft.

Q_{P2} (trial) $= 23,891\left(1-\frac{130}{1224}\right) = 21,354$ cfs → WSE = 724.1; Area = 710 sf.

$V_2 = 2000\left(\frac{710+4900}{2}\right)\frac{1}{43560} = 129$ ac.-ft.

$V_1 \cong V_2 = V_{ave}$

At Housatonic Bridge, WSE = 724.1 ft. and Q = 21,354 cfs

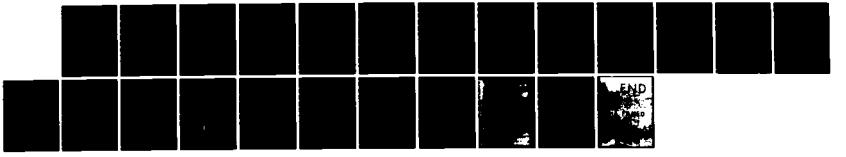
Failure Flood Impact

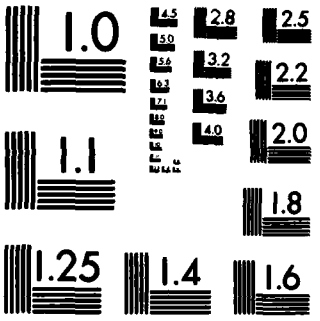
A summary of potential flood impact from a dam failure is shown below:

Location	Type of Development	Depth of Flood Water (feet)
Approximately 2000' to 3000' downstream from Glendale Dam	Route 183 (2-lane highway)	2-5
	Power house	10-15
Approximately 8000' to 9000' downstream from Glendale Dam	Residential — approximately 15 single-family houses	1-6
Village of Housatonic, west bank	Residential - 8-10 single-family houses	2-10
	Commercial - gas station, lumber company, railroad station (not in use), abandoned mill buildings	5-10
	Water tower (≈50 ft. high)	10
Village of Housatonic, east bank	Commercial - heating oil companies, storage, auto repair shop	5

AD-A145 390 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 2/2
GLENDALE DAM (MA 0002.. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JUL 79

UNCLASSIFIED F/G 13/13 NL





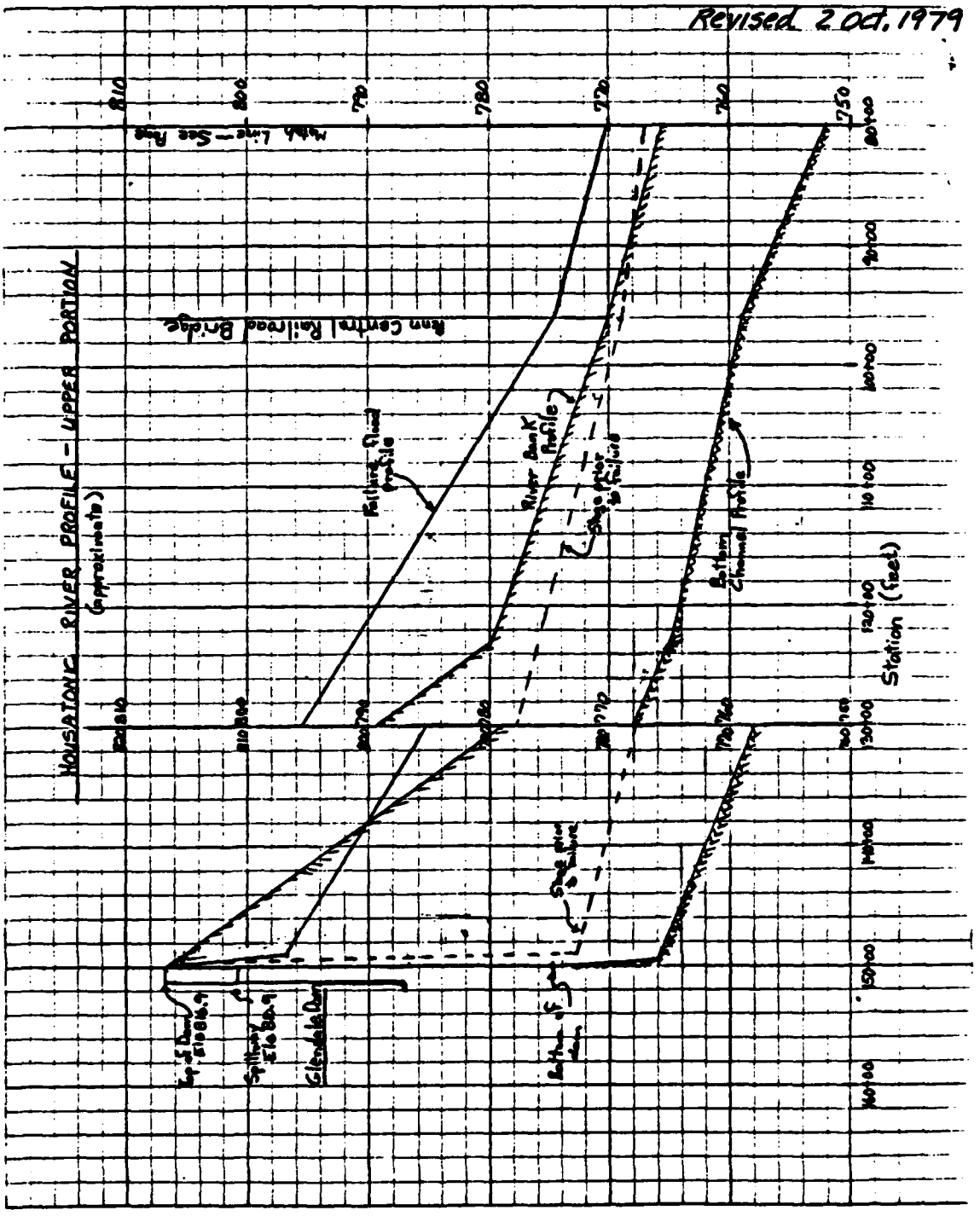
CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-RT-02
DATE CHECKED 8/7/79
CHECKED BY AWG

PAGE 12
DATE 7/12/79
COMPUTED BY RHS

Revised 2 Oct. 1979

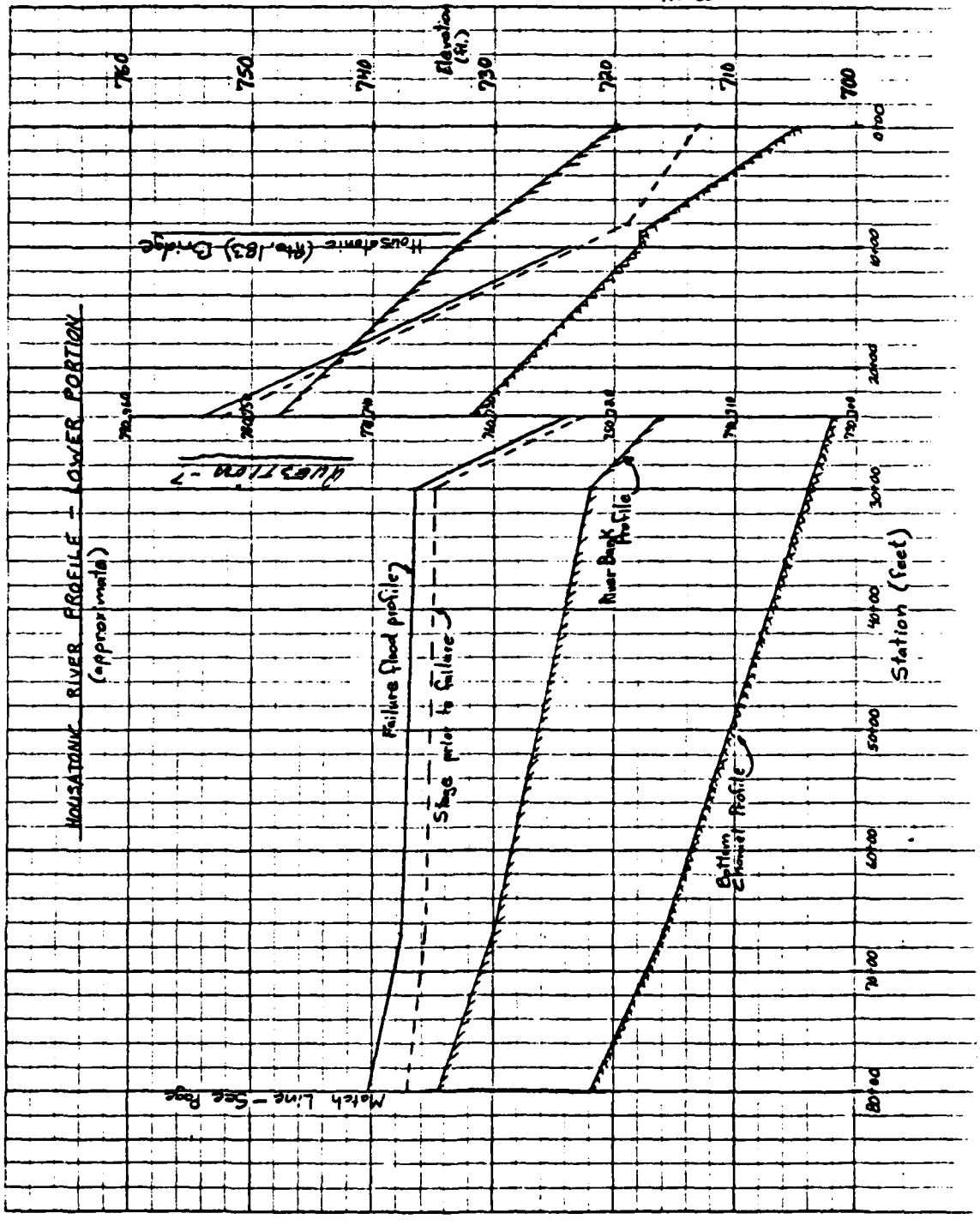


CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam-Stockbridge

JOB NO 561-9-Rt-02
DATE CHECKED 8/7/79
CHECKED BY AWG

PAGE 13
DATE 2/12/79
COMPUTED BY RHS



CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT H & A
PROJECT COE Dams
DETAIL GLENDALE DAM

JOB NO. 561-9-84-2
DATE CHECKED
CHECKED BY

COMPUTED BY
DATE 10/2/79
PAGE NO 14

DOWNSTREAM CHANNEL CROSS SECTIONS AND STAGE - DISCHARGE RELATIONS

D-15

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO. 521-9-84-2
DATE CHECKED
CHECKED BY

COMPUTED BY RNS
DATE 2/5/79
PAGE NO. 1

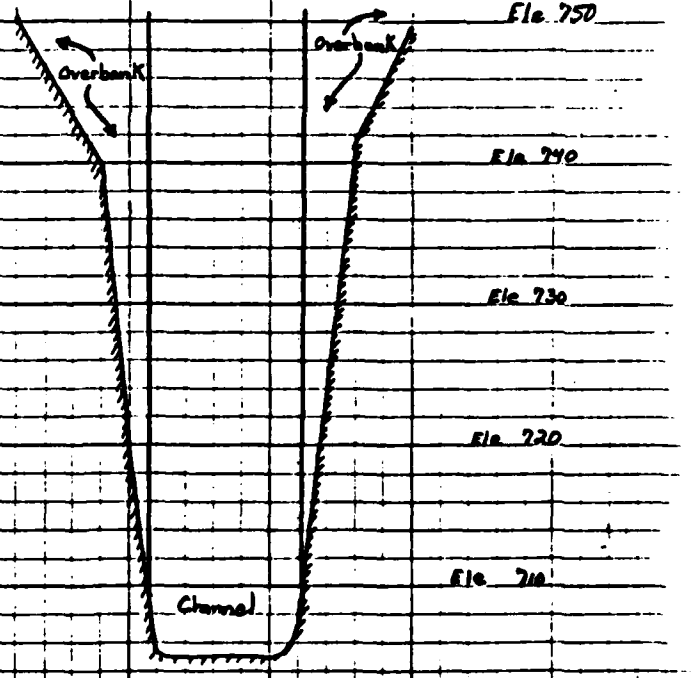
Station 0+00

Cross - Section

Location: 800 ft. downstream from Housatonic Bridge (Route 183)

Scale: Horizontal 1": 250'
Vertical 1": 10'

View: Looking upstream

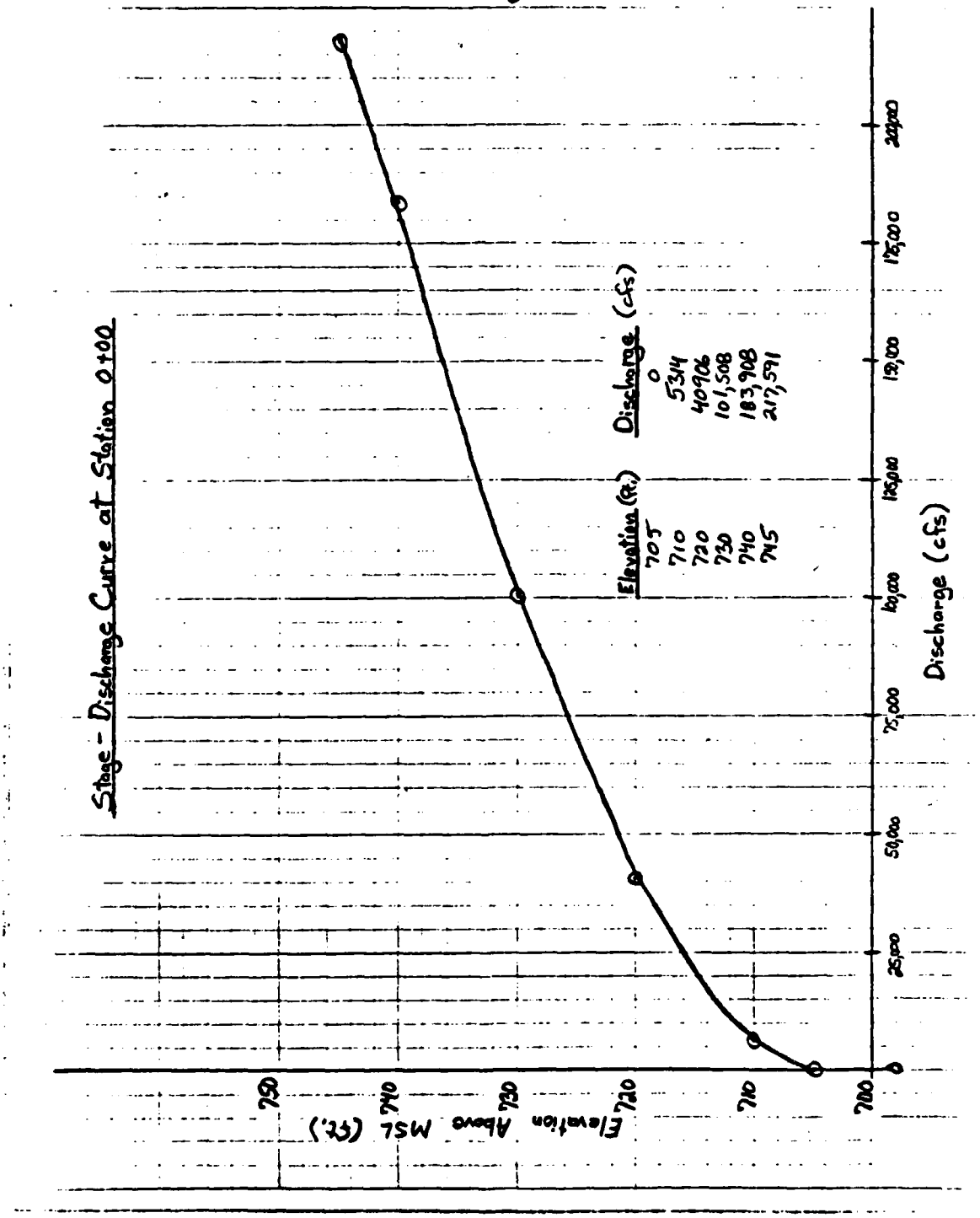


CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-RI-02
DATE CHECKED
CHECKED BY

PAGE 2
DATE 7/18/79
COMPUTED BY RMS



CAMP DRESSER & McKEE — Environmental Engineers — Boston, Mass.

CLIENT Haley and Aldrich
PROJECT CAE Dam Inspection
DETAIL Glendale Dam - Stockbridge

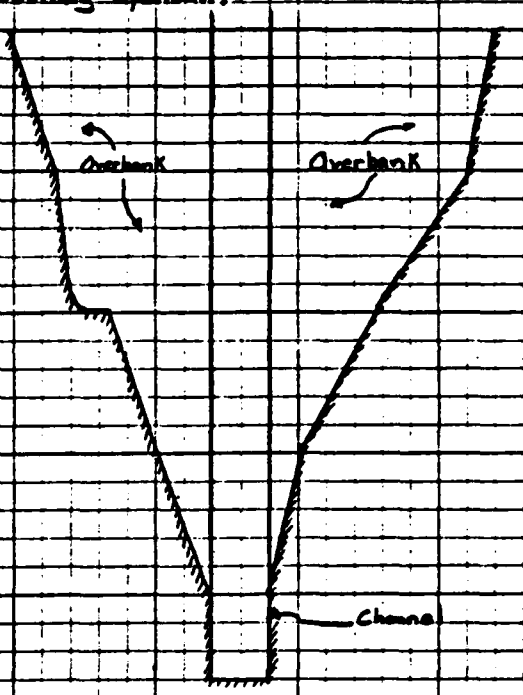
JOB NO. 561-9-RT-2
DATE CHECKED
CHECKED BY

COMPUTED BY RMS
DATE 7/5/79
PAGE NO. 3

Station 9+00
Cross-Section

Location : Downstream at Housatonic Bridge
Scale : Horizontal 1"=250'
Vertical 1"= 10'

View : Looking Upstream



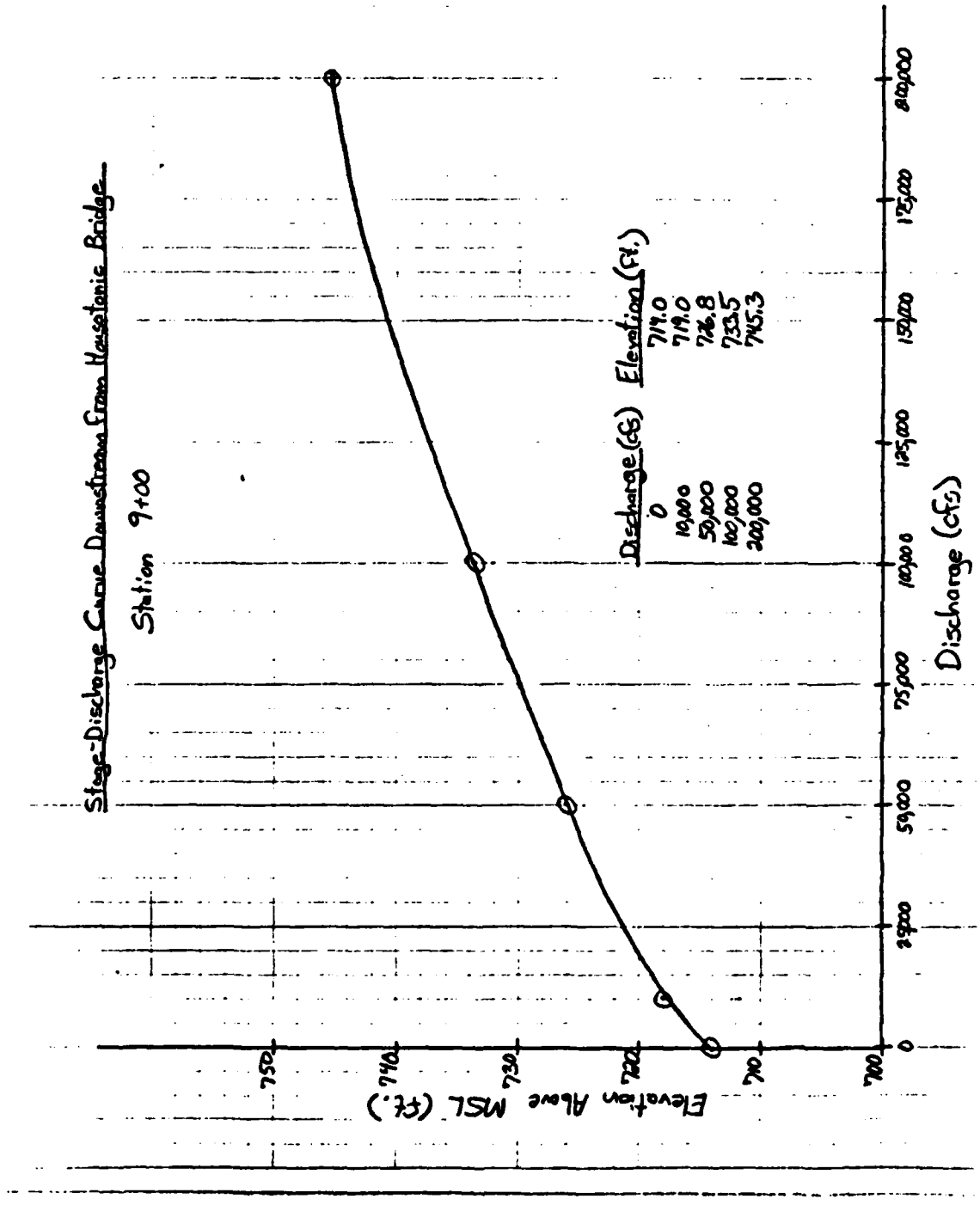
Ele 760
Ele 750
Ele 740
Ele 730
Ele 720
Ele 710

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-81-02
DATE CHECKED
CHECKED BY

PAGE 4
DATE 7/19/79
COMPUTED BY RMS



CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

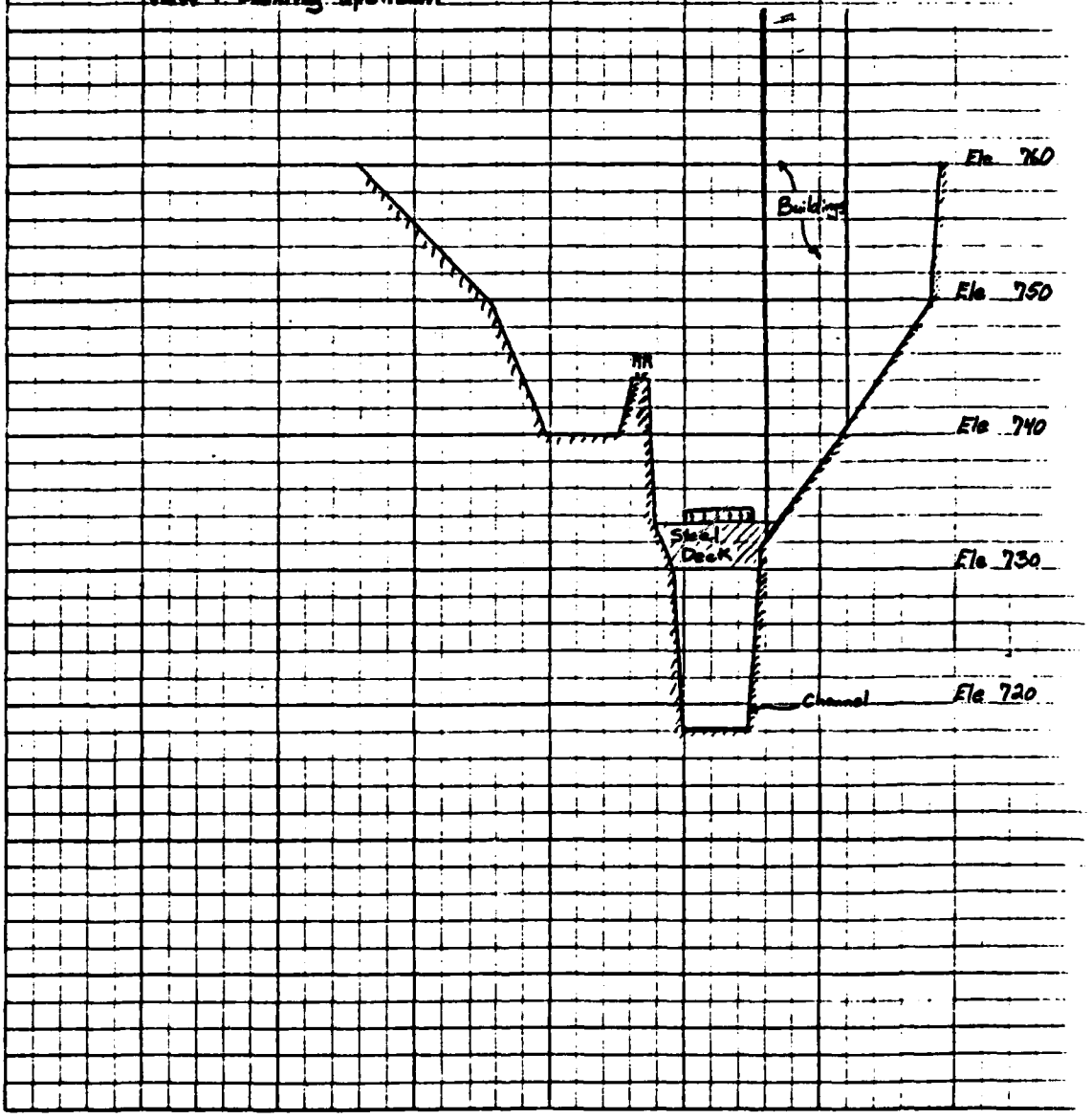
CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO. 561-9-RI-2
DATE CHECKED
CHECKED BY

COMPUTED BY RHS
DATE 7/6/79
PAGE NO. 5

Station 18+00
Cross-Section

Location : Upstream at Housatonic Bridge
Scale : Horizontal 1" = 250'
Vertical 1" = 10'
View : Looking upstream

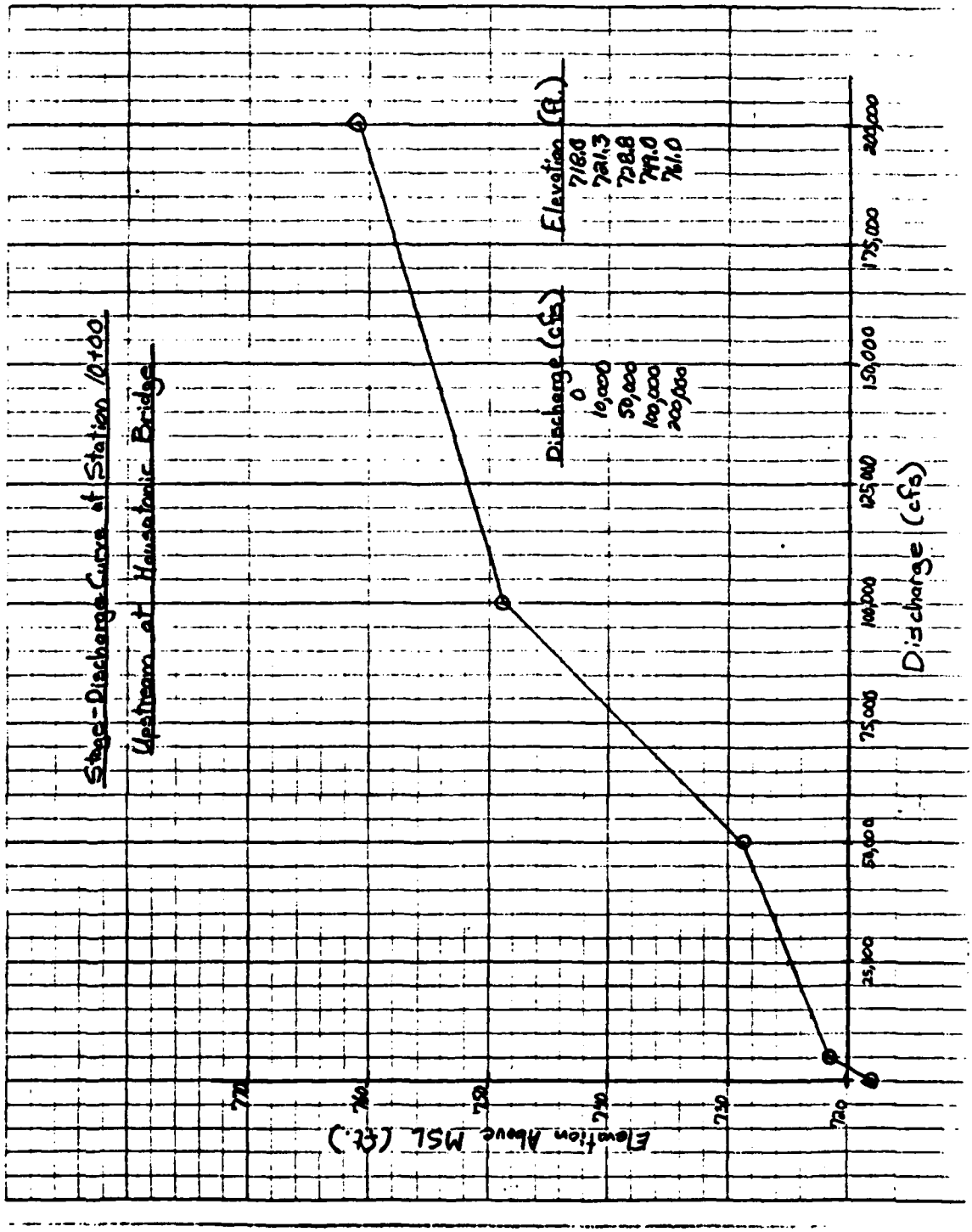


CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-RT-02
DATE CHECKED
CHECKED BY

PAGE 6
DATE 7/10/79
COMPUTED BY RHS



CAMP DRESSER & McKEE Environmental Engineers Boston, Mass.

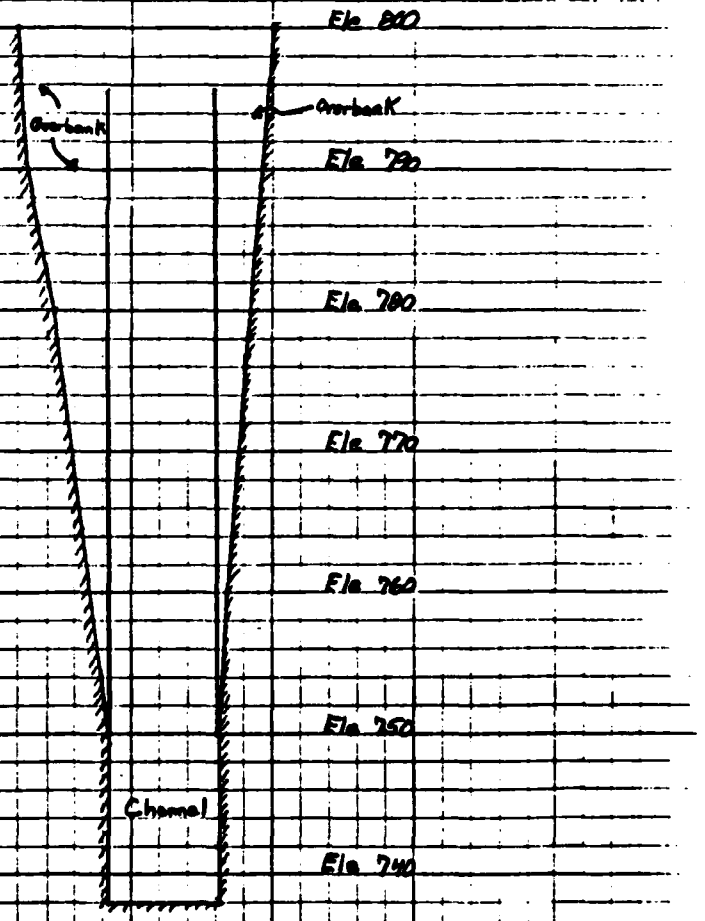
CLIENT Bailey and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO. 561-9-Rt-2
DATE CHECKED
CHECKED BY

COMPUTED BY RHS
DATE 7/6/79
PAGE NO. 7

Station 30+00
Cross-Section

Location: Channel constriction near Village of Housatonic
Scale: Horizontal 1" = 250'
Vertical 1" = 10'
View: Looking upstream



CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

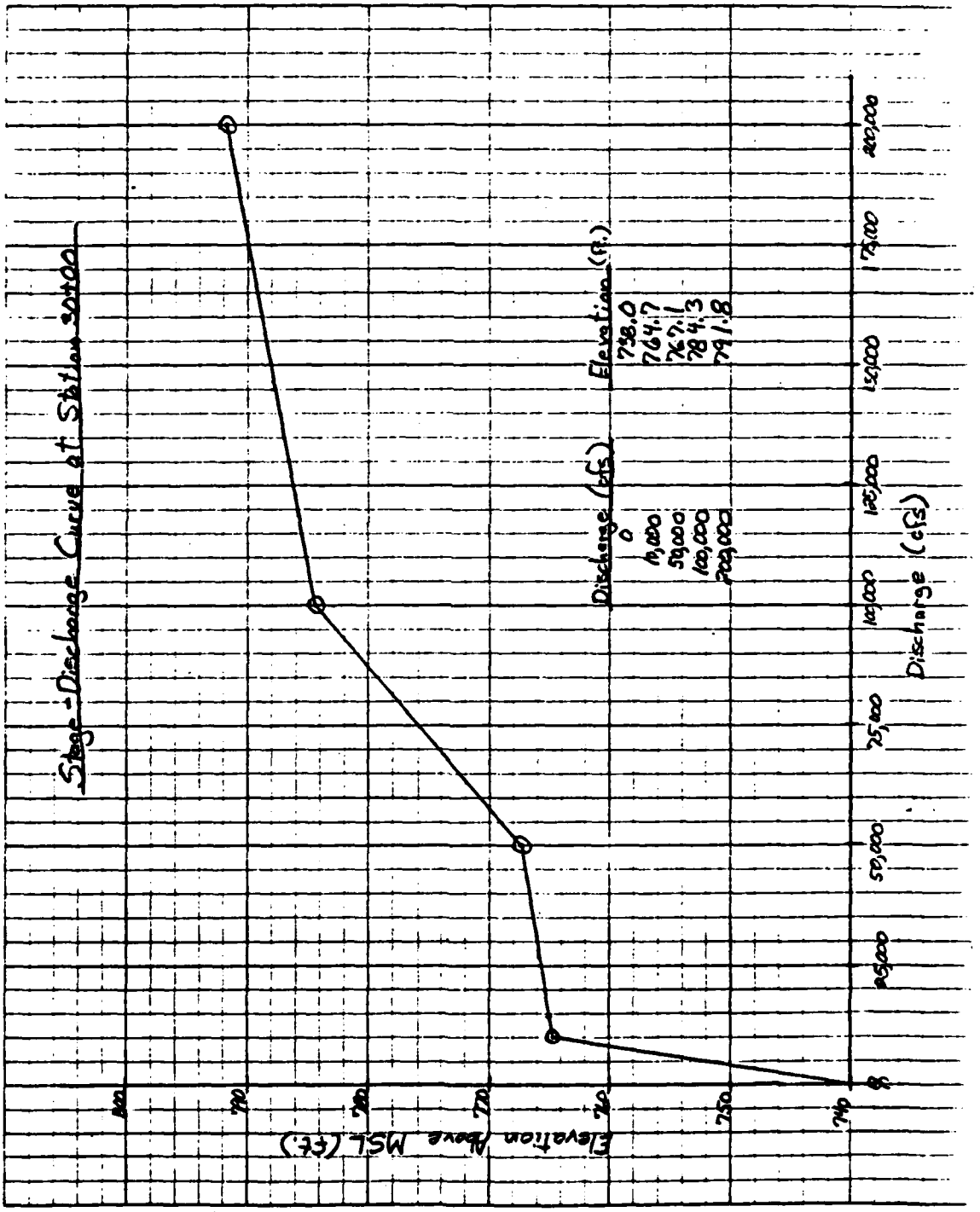
CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-81-02
DATE CHECKED
CHECKED BY

PAGE 6
DATE 7/11/79
COMPUTED BY RHS

Stage - Discharge Curve at Station 30+00

Discharge (cfs)	Elevation (ft.)
0	738.0
15,000	764.7
50,000	782.1
100,000	784.3
200,000	791.8



CAMP DRESSER & McKEE Environmental Engineers Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

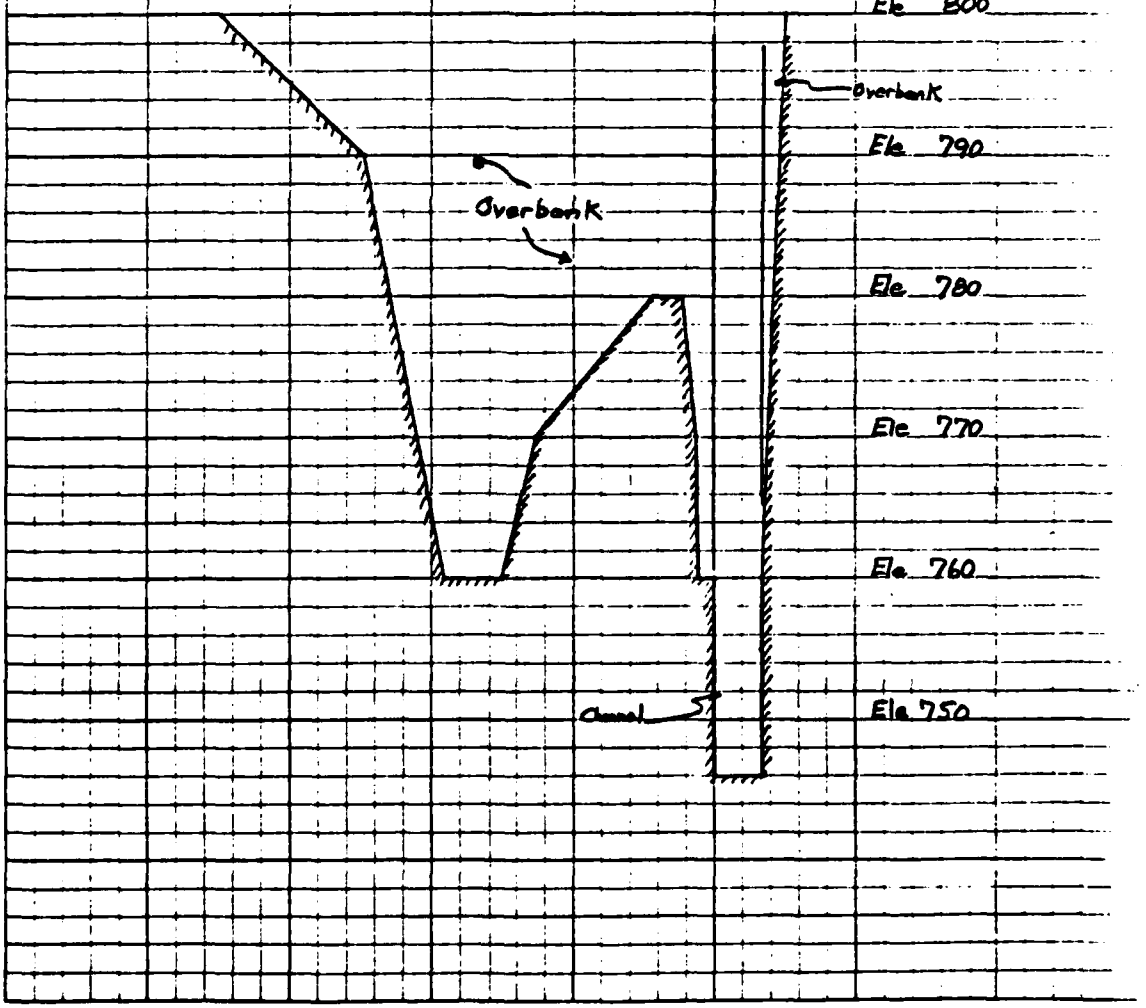
JOB NO. 861-9-81-2
DATE CHECKED
CHECKED BY

COMPUTED BY RHS
DATE 2/6/79
PAGE NO. 9

Station 67+00

Scale: Horizontal 1"=500'
Vertical 1"=10'

View: Looking upstream

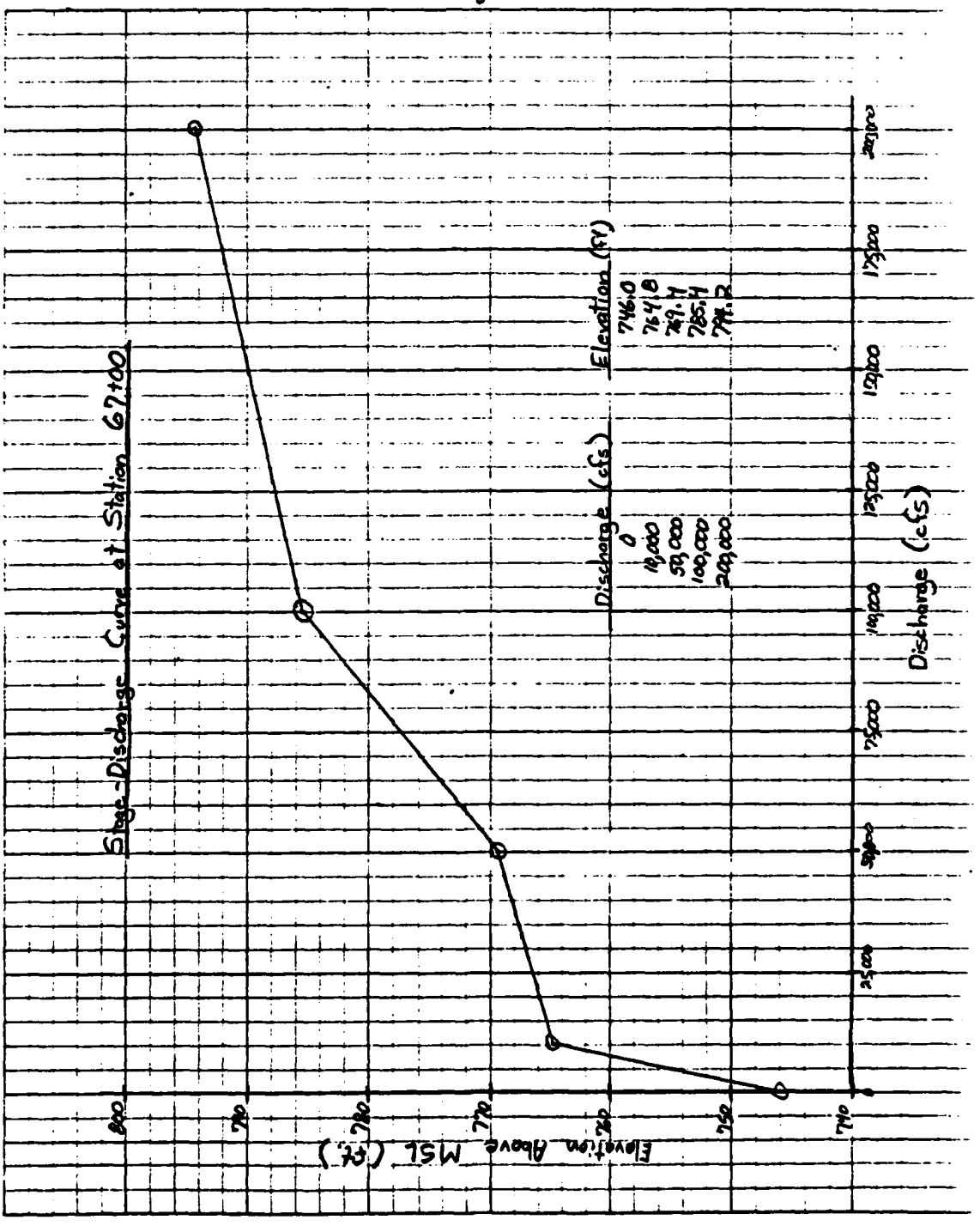


CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-R1-02
DATE CHECKED
CHECKED BY

PAGE 10
DATE 7/11/79
COMPUTED BY RMS



CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

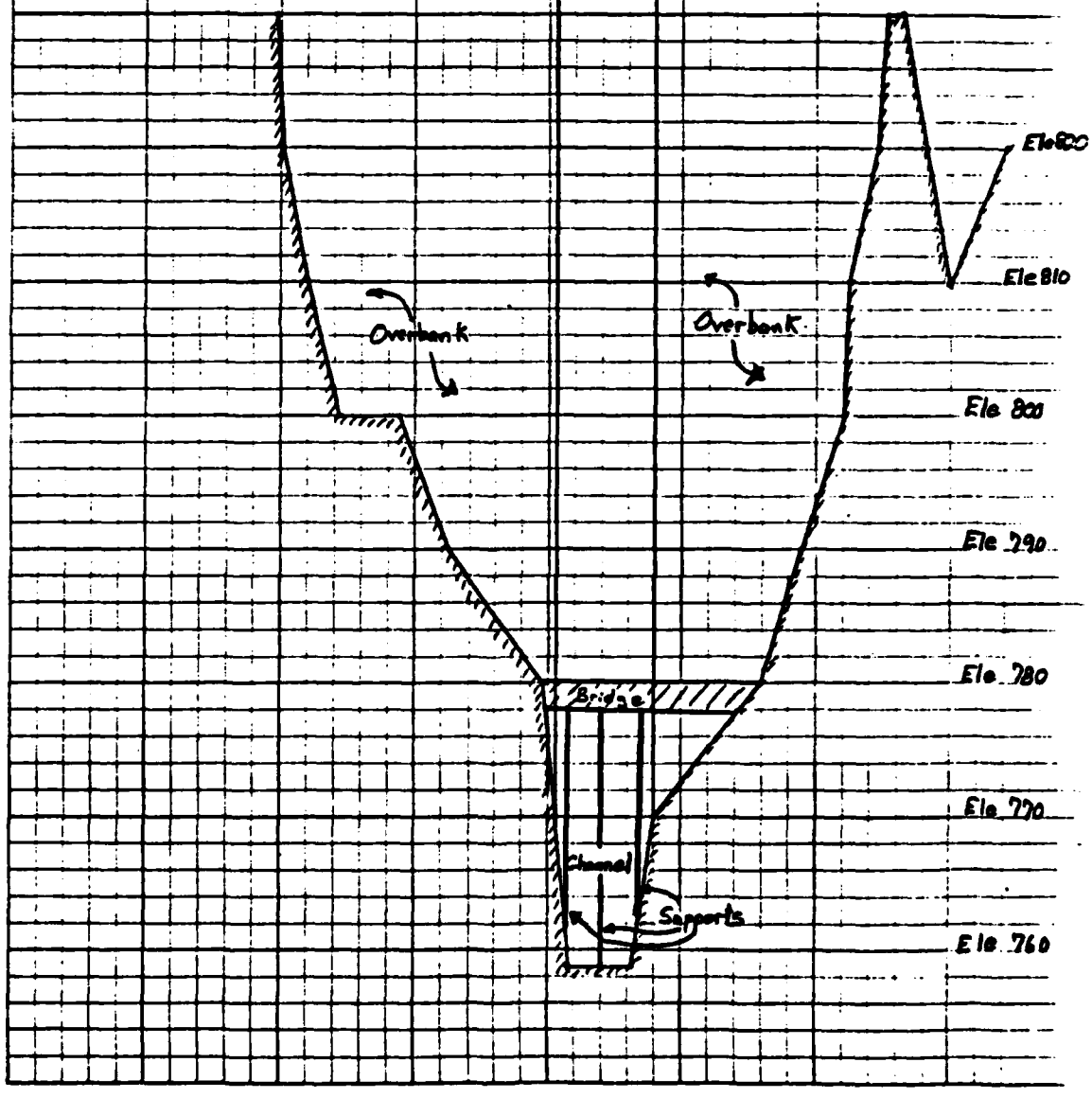
CLIENT Haley and Aldrich
PROJECT CAE Dam Inspection
DETAIL Glendale Dam - Stockbridge

JOB NO. SKI-9-81-2
DATE CHECKED
CHECKED BY

COMPUTED BY RMS
DATE 2/11/79
PAGE NO. 11

Station 96+00
Cross - Section

Location: Railroad bridge
Scale: Horizontal 1"=250'
Vertical 1"=10'
View: Looking Upstream

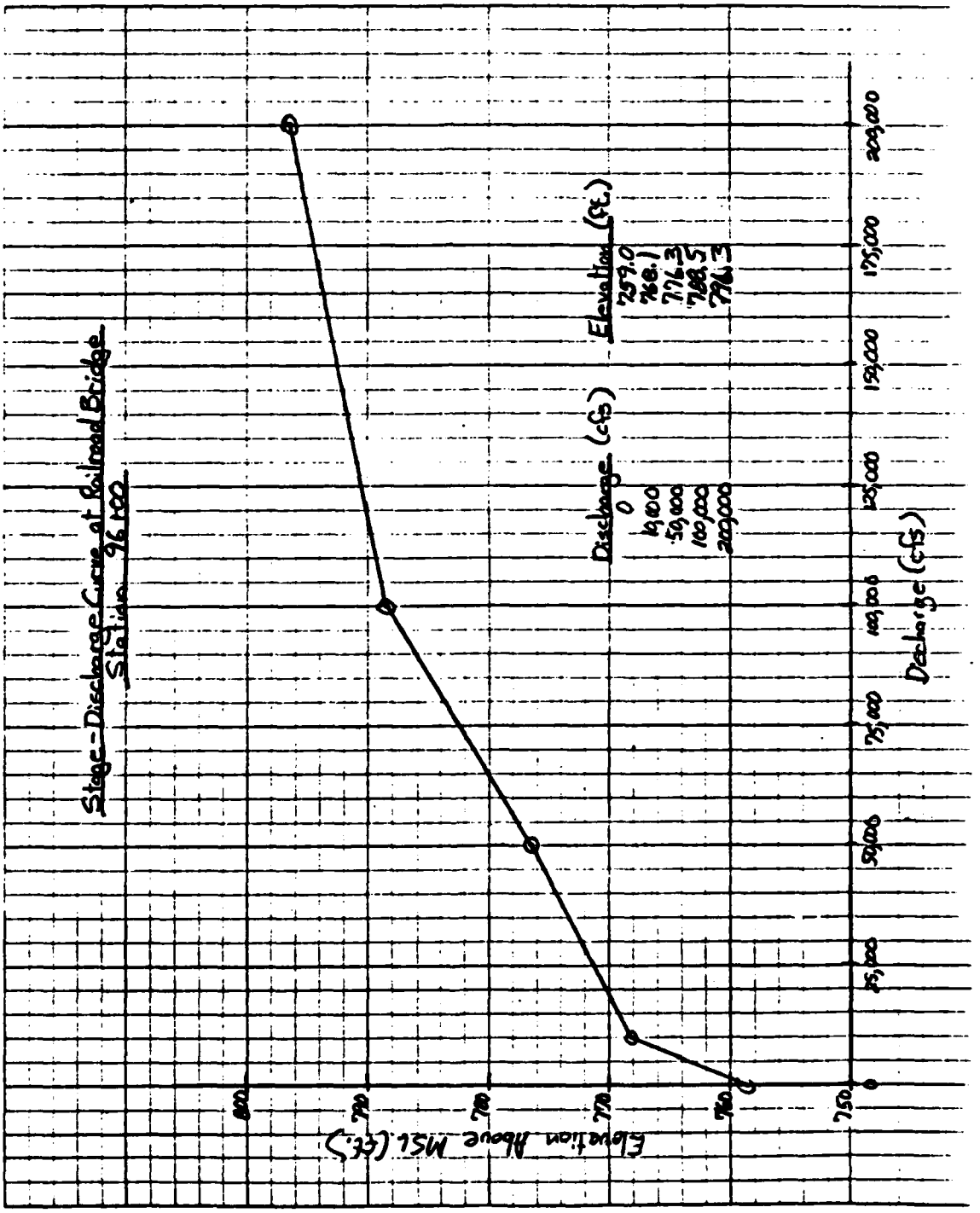


CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO SK1-9-RT-02
DATE CHECKED
CHECKED BY

PAGE 12
DATE 7/11/79
COMPUTED BY RHS



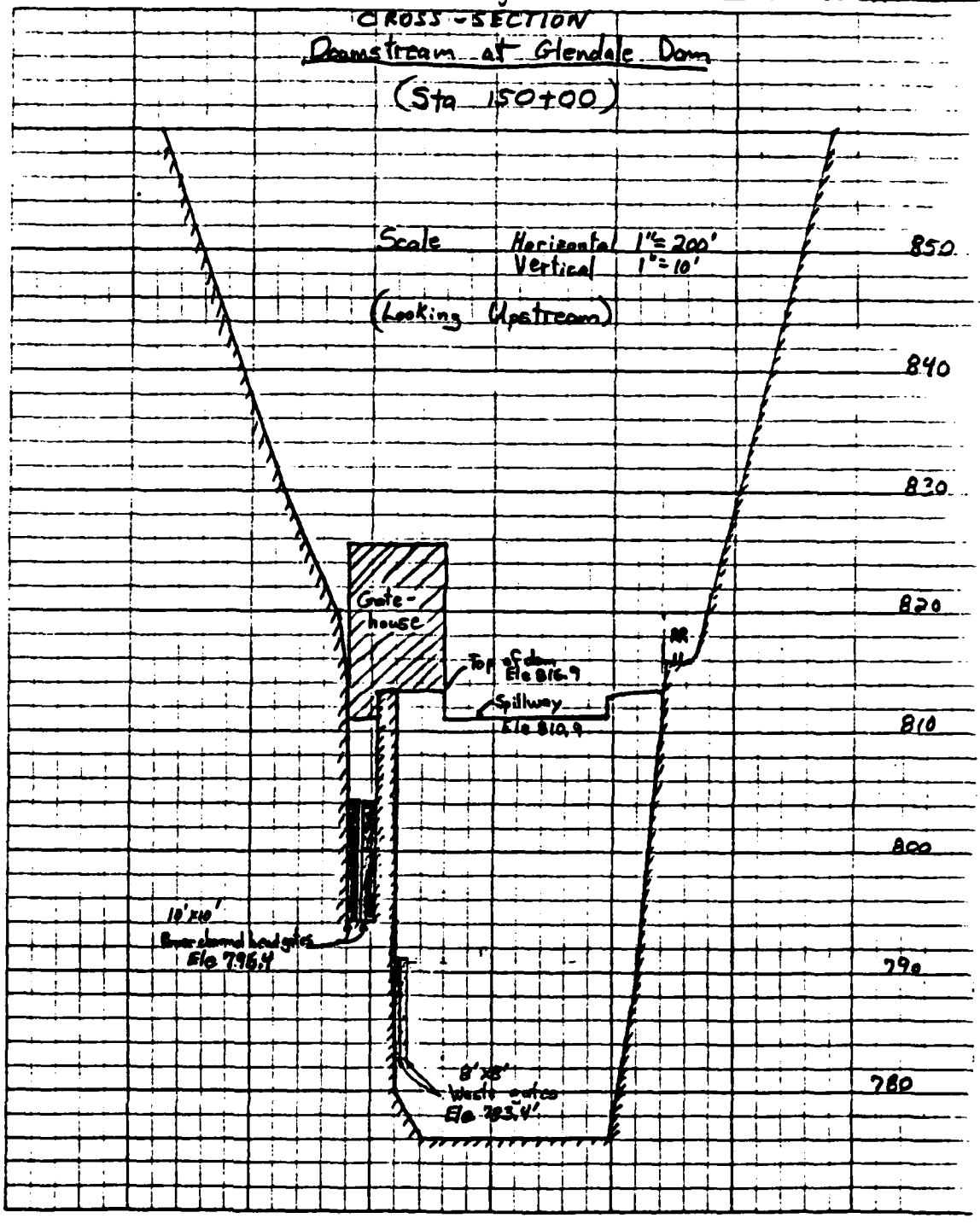
CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 871-9-RT-02
DATE CHECKED
CHECKED BY

PAGE 13
DATE 7/11/79
COMPUTED BY RAS

CROSS-SECTION
Downstream at Glendale Dam
(Sta 150+00)



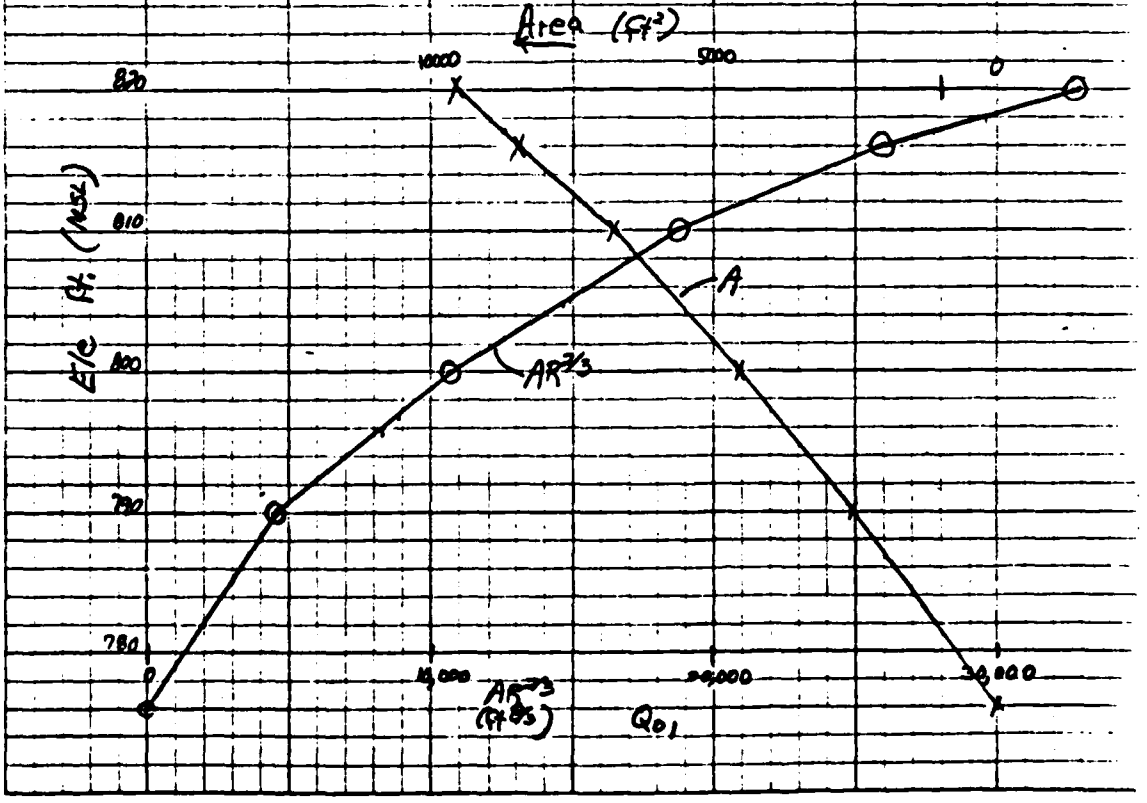
CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-R1-02
DATE CHECKED
CHECKED BY

PAGE 14
DATE 7/11/79
COMPUTED BY RHS

Elevations	Channel n=0.04 A	WP	R	Overbank n=0.10 A	WP	R	Equiv. Area	Total R	$AR^{2/3}$	Q_m
776										0
790	2520	228	11.1				2520	11.1	12504	4658
800	4440	255	17.4							
	132	54								
	4572	289	15.8				4572	15.8	28,812	10,732
810	6778	332	20.4				6778	20.4	52,630	18,860
816	8000	300								
	484	60								
	8484	360	23.6				8484	23.6	69737	25,977
820	9491	376	25.2	136	45	3.0	9504	28.2	88054	32,800



CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT COE Dam Inspections
DETAIL Glendale Dam - Stockbridge

JOB NO 561-9-81-02
DATE CHECKED
CHECKED BY

PAGE 16
DATE 7/11/79
COMPUTED BY RHS

Stage Discharge at Dam

~~Assumed~~

For 10,000 cfs

Tailwater WSE = 781.0

Assume 1. Waste Gates are both open
2. Head gates are both closed

Midpoint of waste gates = 783.4 + 4.0 = 787.4'

Area of waste gates = 64 square feet each
x2 = 128 square feet total

Spillway elevation = 810.9
" length = 182 ft.

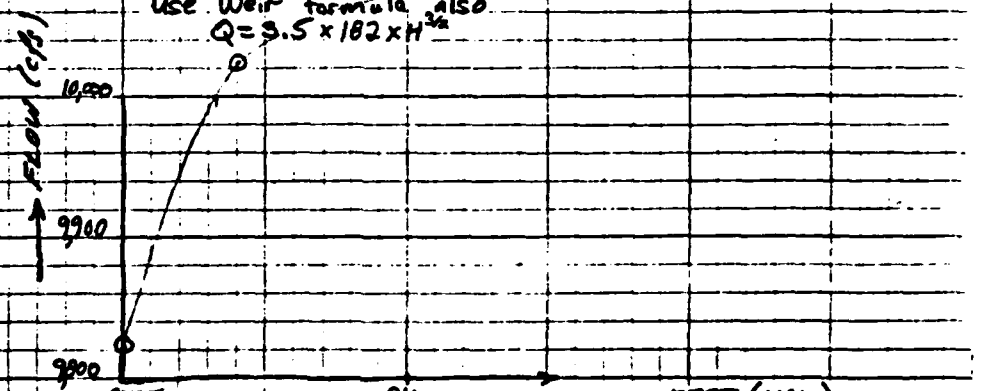
$Q_{ORIFICE} = 0.65 A \sqrt{2gh}$

$10,000 = 0.65 \times 128 \times 8 \sqrt{h}$

$h = 225$ ft. too high

Use Weir formula also

$Q = 3.5 \times 182 \times H^{3/2}$



WSE = 815.7

For 50,000 cfs

Tailwater WSE = 796.8

Use Weir formula for area over spillway and gatehouse.
Use Manning Formula either side of these points
With Manning, assume n = 0.10 and S = 0.0001

Ele 820

Q_{weir} : Spillway = 17,486 cfs
Gatehouse = 0

$Q_{orif.}$: 3,174

$Q_{MANNING}$: $Q = \frac{1.49}{0.10} \times 282 \times 0.0001^{1/2} = 42$

$\Sigma Q = 26,393$

Ele 830

$Q_{SPILLWAY} = 53,172.8$
$Q_{GATEHOUSE} = 80 \times 2.5 \times 4.5^{1.5} = 1909$
$Q_{ORIF} = 3812$
$Q_{MANNING} = \frac{1.49}{0.10} \times 1122 \times \left(\frac{1122}{116}\right)^{2/3} \times 0.0001^{1/2} = 760$ cfs

$\Sigma Q = 59653$

Interpolating, WSE = 827.1

For 100,000 cfs

Tailwater WSE = 805.6

Ele 830

$Q_{SPIL} = 53,173$
$Q_{GATEHOUSE} = 1907$
$Q_{ORIF} = 3298$
$Q_{MANNING} = 760$ cfs
$\Sigma Q = 59,140$

Ele 840 $Q_{SPIL} = 99995$
$Q_{GATEHOUSE} = 11,043$
$Q_{ORIF} = 3916$
$Q_{MANNING} = \frac{1.49}{n}(2200)\left(\frac{3200}{150}\right)^{2/3} \times 0.01 = 1766$
$\Sigma Q = 116,720$ cfs

Interpolating, WSE = 837.1

For 200,000 cfs

Tailwater WSE = 817.4

Ele 860 $Q_{SPIL} = 177,114$
$Q_{GATEHOUSE} = 40,528$
$Q_{ORIF} = 4358$
$Q_{MANNING} = \frac{1.49}{0.10}(6684)\left(\frac{6684}{296}\right)^{2/3} \times 0.01 = 7956$
$\Sigma Q = 229,956$

Ele 855 $Q_{SPIL} = 146,866$
$Q_{GATEHOUSE} = 32,045$
$Q_{ORIF} = 4094$
$Q_{MANNING} = \frac{1.49}{0.10}(5301)\left(\frac{5301}{264}\right)^{2/3} \times 0.01 = 5835$
$\Sigma Q = 188,840$

Interpolating, W.S.E = 856.4

APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE CONG. DIST.	COUNTY CONG. DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY | MO | YR
MA	21	NED	MA 003	01	GLENDALE DAM	4216.8	7320.7	31AUG79

POPULAR NAME	NAME OF IMPOUNDMENT
	HOUSATONIC RIVER

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	07	HOUSATONIC RIVER	HOUSATONIC (GREAT BARRINGTON	2	7068

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	INSPECTION DIST	OWNER	FED REG	PRIV/FED	SCS ASSIST	VERIFICATION DATE
PGCT	1906	H	46	32	2550	40	NED	N	N	N	N	31AUG79

REMARKS

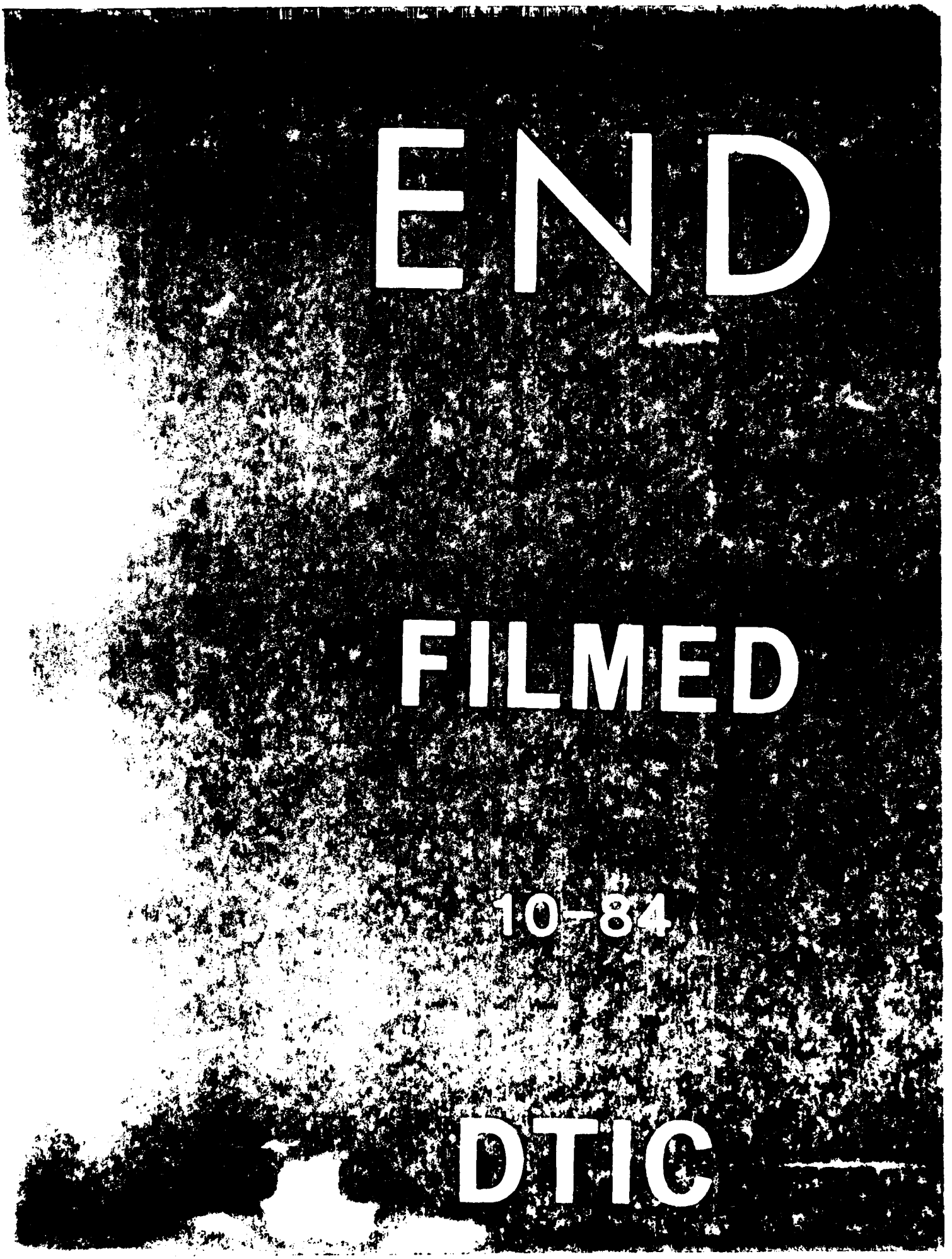
D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LOCK 1 LENGTH (FT.)	LOCK 1 WIDTH (FT.)	LOCK 2 LENGTH (FT.)	LOCK 2 WIDTH (FT.)	LOCK 3 LENGTH (FT.)	LOCK 3 WIDTH (FT.)	LOCK 4 LENGTH (FT.)	LOCK 4 WIDTH (FT.)
2	240	U	182	9360	4000											

OWNER	ENGINEERING BY	CONSTRUCTION BY
HOUSATONIC ENERGY		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	MA DPW

INSPECTION BY	INSPECTION DATE DAY | MO | YR	AUTHORITY FOR INSPECTION
HALEY + ALDRICH, INC.	30MAY79	PUBLIC LAW 92-367 8AUG1972

REMARKS
86-CONSERVATION ASSOCIATION


END
FILMED
10-84
DTIC